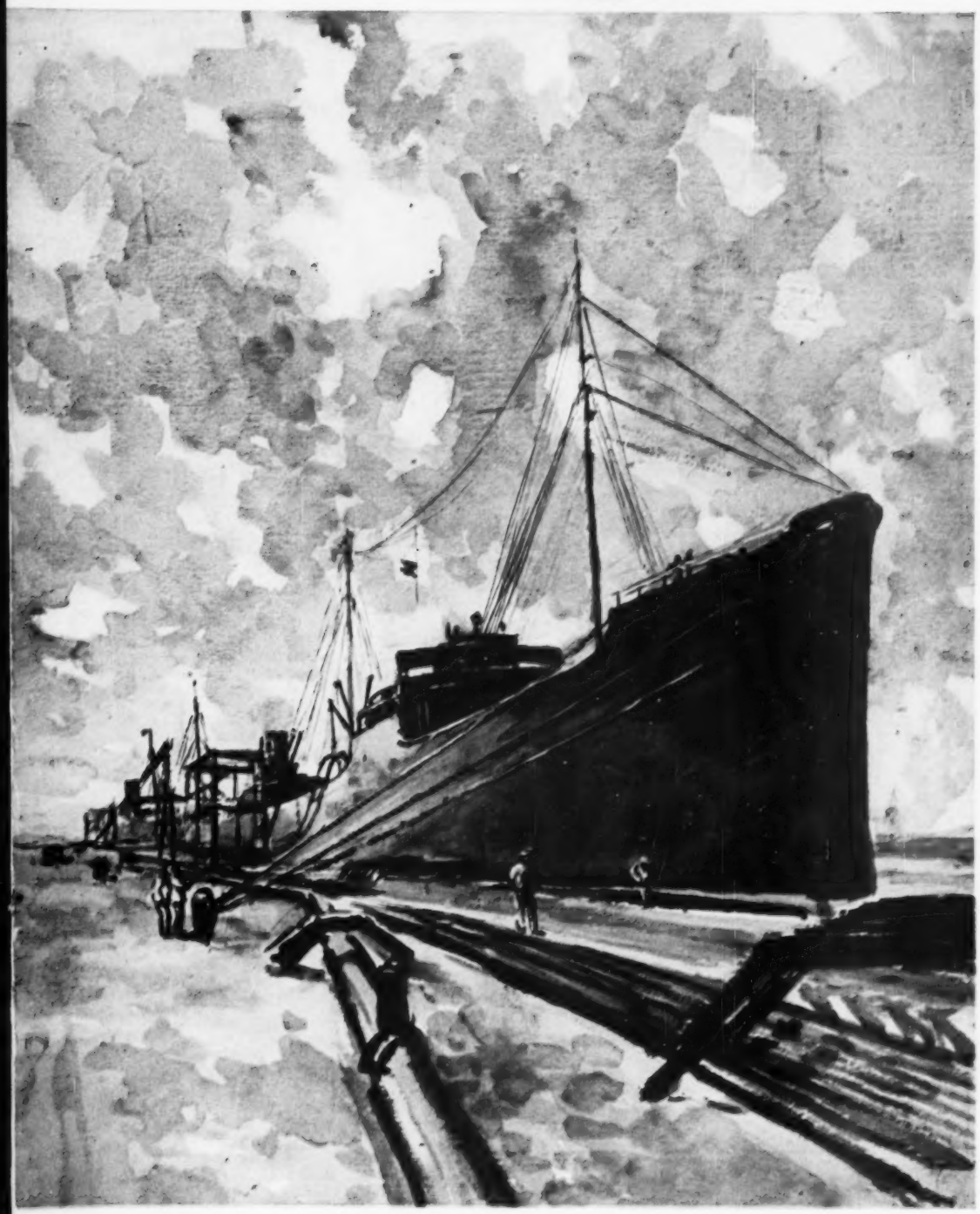
WORLD PETROLEUM



november, 1949

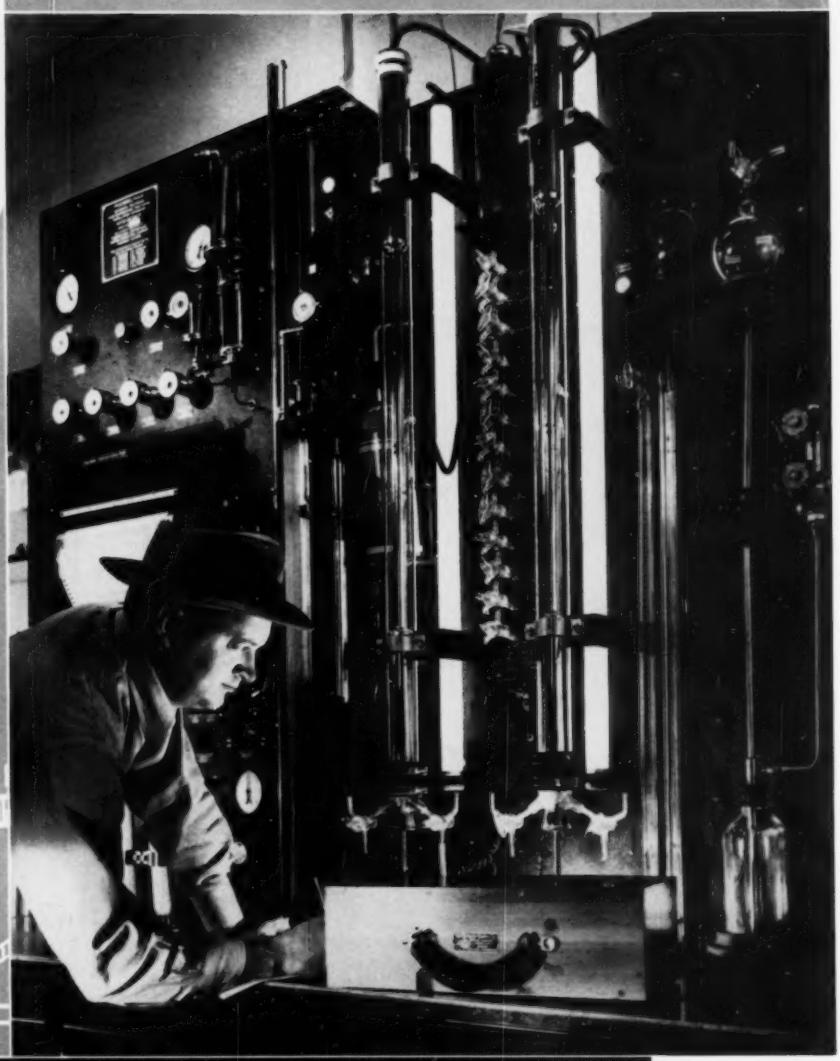
29th annual meeting

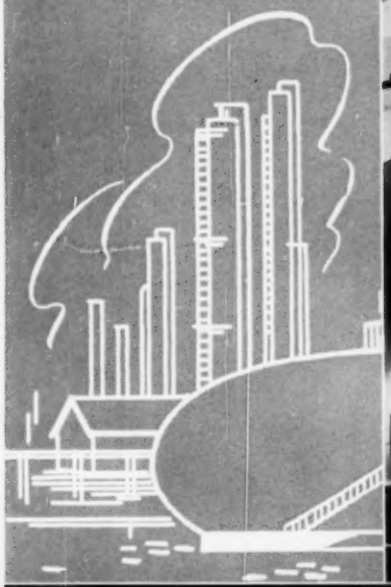
five dollars per year fifty cents per copy

7 Reasons WHY IT'S WARREN

1. PERSONNEL
2. EXPERIENCE
3. FACILITIES
4. PRODUCTION
5. STORAGE
6. TRANSPORTATION
7. RESEARCH

Complete and continuous research and testing by Warren's two Research Laboratories.



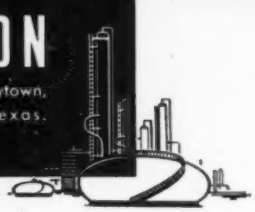


WARREN PETROLEUM CORPORATION

Producers, Manufacturers, Exporters and Marketers

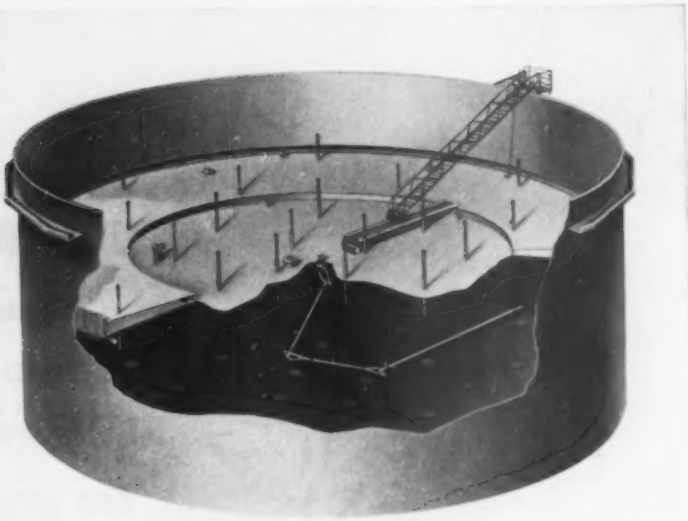
Export Terminals: Corpus Christi, Port Arthur, Baytown, Texas City, and Norsworthy, Houston, Texas.

TULSA 2, OKLAHOMA CABLE ADDRESSES: Stavolene, Warren



Crude Oil, Natural Gasoline and Liquefied Petroleum Products

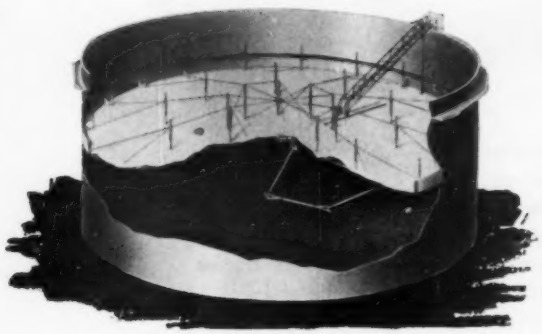
THE HORTON *PONTOON* FLOATING ROOF



This outstanding design gives you effective, economical protection from evaporation losses when you are storing large volumes of crude oil, gasoline, and similar petroleum products in flat-bottom tanks. The reduction or prevention of evaporation losses is not the only benefit it offers. When you equip a tank with a PONTOON roof, the fire hazard is reduced and most of the maintenance caused by corrosion is eliminated. Furthermore, the air space in the pontoon section helps reduce "boiling" losses because it serves as an effective insulating medium for more than half of the area of the tank. This annular pontoon ring is divided into compartments to increase the stability of the roof.

The Horton PONTOON Floating Roof is installed on new or existing tanks which are 60 ft. in diameter or larger. You can transform existing fixed-roof tanks into vapor-saving units by equipping them with this efficient floating roof. For the best results, use it on working tanks, tanks in blending service, and tanks storing corrosive products.

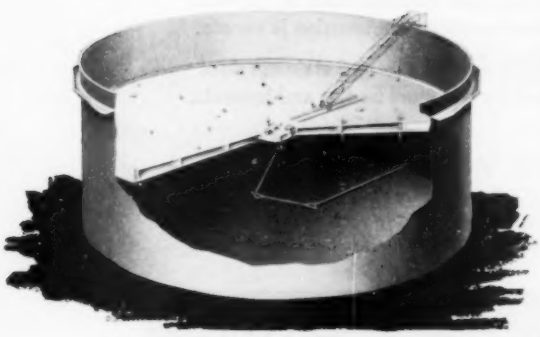
THERE ARE *Three Types* OF HORTON* FLOATING ROOFS FOR A WIDE RANGE OF STORAGE REQUIREMENTS



THE HORTON *DOUBLE-DECK* FLOATING ROOF

This type—most recent design of all three—embodies the best construction features gained through many years of experience in building floating roofs. Each feature increases the effectiveness of the roof because it adds a plus benefit to the evaporation protection provided by the basic Horton design. For example, the insulation provided by double-deck construction increases the range in volatility of petroleum products that can be stored economically in tanks equipped with this roof.

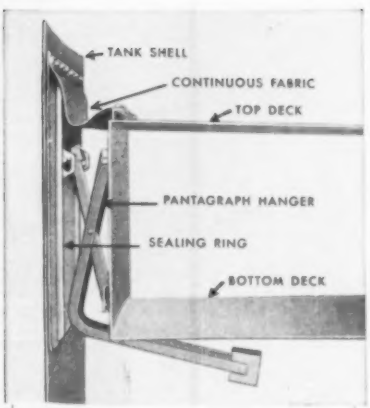
The Horton Double-Deck Floating Roof can be installed on new or existing tanks which are 15 ft. in diam. or larger. It offers efficient storage for petroleum products ranging in volatility from crude oil to aviation gasoline.



THE HORTON *Pan-Type* FLOATING ROOF

This roof is suitable for use on working tanks as it effectively reduces filling and emptying losses. It is also used to reduce the fire hazard and decrease corrosion in tanks storing fuel oil and other heavy petroleum products where "boiling" losses are not an important factor. The Horton PAN Floating Roof can be installed on new or existing flat-bottom tanks which are 15 ft. in diam. or larger.

**Trademark Registered in U.S. Patent Office*



ALL THREE TYPES HAVE THESE FEATURES

The improved Horton Seal

This is the most effective device ever developed for preventing the escape of vapor around the edge of a floating roof deck. As the diagram above shows, the pantagraph hangers hold the sealing ring snugly against the tank shell as the roof moves up and down. The continuous fabric closes the space between the deck and sealing ring.

The basic Horton principle

All three Horton Roofs *float directly on the surface* of the liquid in the tank. There is no vapor space under the roof. As a result, evaporation losses due to "breathing" and "filling" are eliminated, corrosion is decreased, and the fire hazard is minimized.

CHICAGO BRIDGE & IRON COMPANY

Chicago • Houston • Tulsa • San Francisco • Birmingham • Atlanta • Cleveland • Philadelphia • Los Angeles • Salt Lake City • Boston • Seattle • Detroit

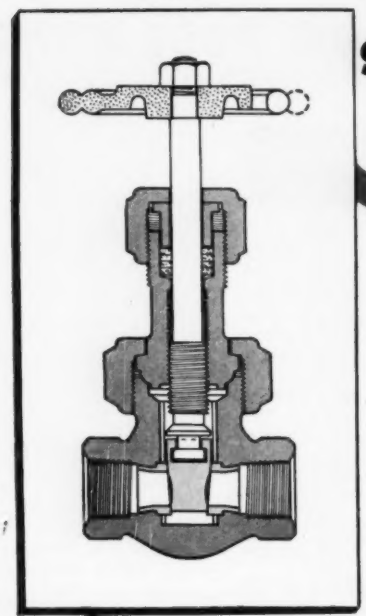
Plants: Birmingham, Chicago, Salt Lake City and Greenville, Pa., U.S.A. Export Office—165 Broadway Building, New York 6, N. Y., U.S.A.

REPRESENTATIVES AND LICENSEES

Ateliers et Chantiers de la Seine Maritime, Paris, France
Constructions Metalliques de Provence, Arles-sur-Rhone, France
Chicago Bridge & Iron Company, Ltd., Apartado 1348, Caracas, Venezuela
Compagnia Tecnica Industrie Petroli, Rome, Italy
Whessoe, Limited, Darlington, England
Motherwell Bridge & Engineering Company, Limited, Motherwell, Scotland
Horton Steel Works, Limited, Fort Erie, Ontario, Canada
W. P. Bryant, Edificio Abreu 402, Havana, Cuba

"Where can I get compact, high quality, high pressure Gate Valves for general service?"

"Order VOGT Series 9850"*



Operating men everywhere rate these valves as tops for general gate valve service including meter and gauge lines, drip and drain lines, etc. Series 9850 valves have drop forged carbon steel bodies and bonnets, rolled in 11½-13% chrome stainless steel seat rings which can be easily renewed, and a solid stainless steel wedge. A ground joint insures tightness between body and bonnet. The stuffing box can be repacked under pressure when the valve is open.

Also available is Series 9750, completely fabricated from 18-8 stainless steel for services where internal or external corrosion is severe.

Series 9850-F8 valves have 18-8 stainless steel trimmings and carbon steel bodies and bonnets.

*Series 9850

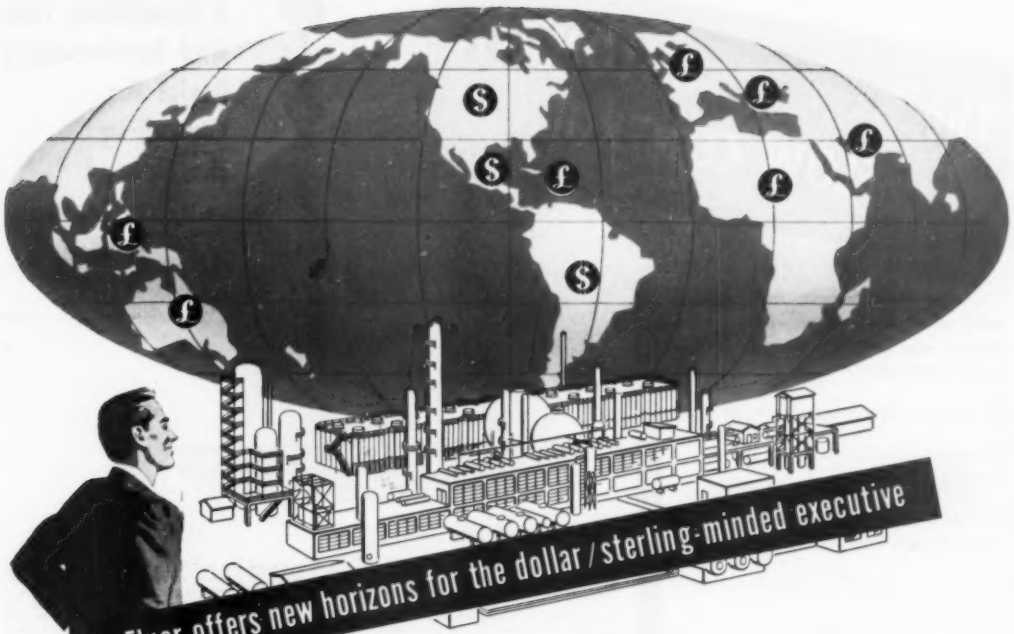
CARBON STEEL } 800 Pounds @ 750° F. 1500 Pounds Cold Non-Shock

For 150-800 pounds general service Union Bonnet • Ground Joint • Inside Screw Stem • Renewable Seat Rings • Solid Wedge — Slotted Type • 11½-13% Chrome Stainless Steel Trimmings Sizes ¼" to 2" inclusive.

HENRY VOGT MACHINE CO.
Louisville 10, Ky.

BRANCH OFFICES: NEW YORK • PHILADELPHIA CLEVELAND • CHICAGO • ST. LOUIS • DALLAS

Vogt DROP FORGED STEEL VALVES



Fluor offers new horizons for the dollar/sterling-minded executive

TO FACILITATE the building of petroleum, chemical and auxiliary plants in the sterling and other areas, The Fluor Corporation, Ltd., is pleased to announce its association with Head Wrightson Processes Ltd., a British Engineering Organization, currently engaged in the engineering, supply and erection of units for Light Oil and Crude Oil Fractionation, Gas Separation, Solvent Extraction, Chemical Treating, Utilities Supply, Carbon Black Production, etc., within the British Commonwealth and other countries.

Unlimited Facilities... The agreement between The Fluor Corporation, Ltd., and Head Wrightson Processes Ltd. opens new fields for capital investment in the sterling and other areas by making available . . .

. . . Process design, engineering, purchasing, progressing, inspection, shipping and erection supervision of petroleum and chemical processing facilities throughout the world by the *combined* staffs of The Fluor Corporation, Ltd., in the United States and Head Wrightson Processes Ltd. in England.

. . . The manufacture and availability in the sterling area of Fluor-designed products including Cooling Towers, both atmospheric and mechanical draft; Fin-Fan Air-Cooled Heat Exchangers; Air-Cooled Mufflers; Pulsation Dampeners and Gas Cleaners.

All Fluor products fabricated by Head Wrightson Process Ltd. will be in strict accordance with Fluor design specifications and will bear the same performance guarantee afforded Fluor products manufactured in the United States. They will be marketed by Head Wrightson Processes Ltd. throughout the sterling area as Fluor products.

A Flexible Agreement... The agreement between The Fluor Corporation, Ltd., and Head Wrightson Processes Ltd., is of such flexibility as to offer the investor a free choice in determining the allocation of available currencies between various phases of a project and in arranging the localization of the engineering and fabrication in the best way to meet attendant circumstances. The most advantageous arrangements, varying from case to case, may be determined during the discussions preceding a contract.

Products and Services offered to the investor under the association between The Fluor Corporation, Ltd., and Head Wrightson Processes Ltd., are payable in some cases entirely in sterling or, in other cases, largely in sterling with a minimum of dollars involved.

FLUOR

BE SURE WITH FLUOR

Detailed information on how this association between The Fluor Corporation, Ltd., and Head Wrightson Processes Ltd. can benefit your particular dollar/sterling investment requirements will be gladly furnished upon request to *either* The Fluor Corporation, Ltd., Los Angeles, California, or Head Wrightson Processes Ltd., London, England.

Designers and Constructors of Refinery, Chemical and Natural Gas Processing Units.
Manufacturers of Cooling Towers, Fin-Fan Units, Mufflers, Gas Cleaners and Pulsation Dampeners.

THE FLUOR CORPORATION, LTD. *Los Angeles 22* • NEW YORK • CHICAGO • BOSTON • PITTSBURGH • TULSA • HOUSTON • SAN FRANCISCO

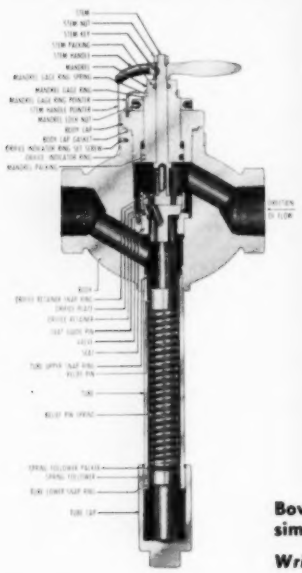
HEAD WRIGHTSON PROCESSES LTD. TEESDALE HOUSE, BALTIC STREET, LONDON, E.C.1, ENGLAND

The BOWEN AUTOMATIC FLOW CONTROL

A Completely New And Revolutionary Device For Controlling The Flow of Producing Wells

The Bowen Automatic Flow Control installed on the flow line at the well head brings operators many desirable features that were previously unobtainable.

- Automatically controls production.
- Automatically prevents excessive loading.
- Permits positive regulation at the lowest possible gas-oil ratio.
- Reduces paraffin problems to a minimum.
- Automatically controls gas surges.



FOR FLOWING WELLS

With a Bowen Automatic Flow Control in place and with the Relief Pin Spring adjusted so that normal pressure will hold the Valve against the Seat, fluid enters the Body as indicated on the illustration. It flows through the upper port of the Body into the upper chamber, down through the Orifice Plate and Valve and out the lower port of the Body. When the pressure drops below the setting of the Relief Pin Spring, the Valve automatically raises and allows fluid to flow between the Valve and the Seat as well as through the Orifice Plate. Thus, constant and uniform flow is insured despite low-pressure intervals. In addition, the automatic raising of the Valve during a low-pressure interval prevents excessive fluid loading from killing the well because the excessive fluid load is automatically dissipated at a desired volume and velocity. By proper setting of the Relief Pin Spring and proper selection of orifice in the Orifice Plate, the lowest possible gas-oil ratio is automatically maintained. This uniform control prevents rapid gas expansion and greatly deters the formation of paraffin on the tubing walls.

IDEAL FOR CURTAILMENT: Provides a positive means for automatically controlling production at a reduced rate with no danger of killing the well.

EXCELLENT FOR REPRESSURING: Greatly reduces the volume of gas that must be pumped into the formation.

DESIGNED FOR EFFICIENT PRODUCTION: Prevents rapid and wasteful dissipation of gas pressure and thereby prolongs the lives of flowing wells, extends the lives of pumping wells, and substantially increases the total ultimate recovery from an oil pool.

FOR PUMPING WELLS

With a Bowen Automatic Flow Control in place and with the Relief Pin Spring adjusted so that under normal pressure the valve is held off the Seat, fluid enters the Body as indicated in the illustration. It flows through the upper port of the Body into the upper chamber, down through the Orifice Plate and Valve, and between the Valve and the Seat and out the lower port of the Body. When the pressure rises above the setting of the Relief Pin Spring, the Valve automatically lowers against the Seat and the fluid can then pass only through the restricted orifice in the Orifice Plate. Thus, a sudden surge of gas cannot create disastrous sand conditions and cannot blow the hole dry and gas-locked pumps are avoided. In addition, the uniform control that is automatically maintained reduces sand and paraffin problems to a minimum.

CONSTRUCTION

Bowen Automatic Flow Controls consist essentially of a Body, a spring-loaded Valve and an adjustable Orifice Plate. The Body provides the connections to the flow lines; the spring loading on the Valve is controlled by adjusting the Tube Cap; the amount that the Valve can open is controlled by adjusting the Mandrel; the desired orifice in the Orifice Plate is selected by adjusting the Stem Handle. Upon installation, it is necessary to adjust the spring loading and the valve opening and to select the proper orifice to meet the particular conditions of the well.

Bowen Automatic Flow Controls are economical in price, easy to install, and simple to operate.

Write for descriptive Bulletin!

SR BOWEN CO

MAIN OFFICE AND PLANT:
11006 SOUTH NORWALK BOULEVARD
SANTA FE SPRINGS, CALIFORNIA

EXPORT OFFICE:
30 ROCKEFELLER PLAZA
NEW YORK CITY, NEW YORK

EXPORT REPRESENTATIVE: VAL. R. WITTICH, JR.

ETHYL... *first in antiknock service*

ETHYL CORPORATION

Chrysler Building, New York 17, N. Y.

Products sold under the "ETHYL" trade-mark: Antiknock Compounds . . . Salt Cake . . . Ethylene Dichloride . . . Sodium (metallic) . . . Chlorine (liquid) . . . Oil Soluble Dye . . . Benzene Hexachloride (technical)

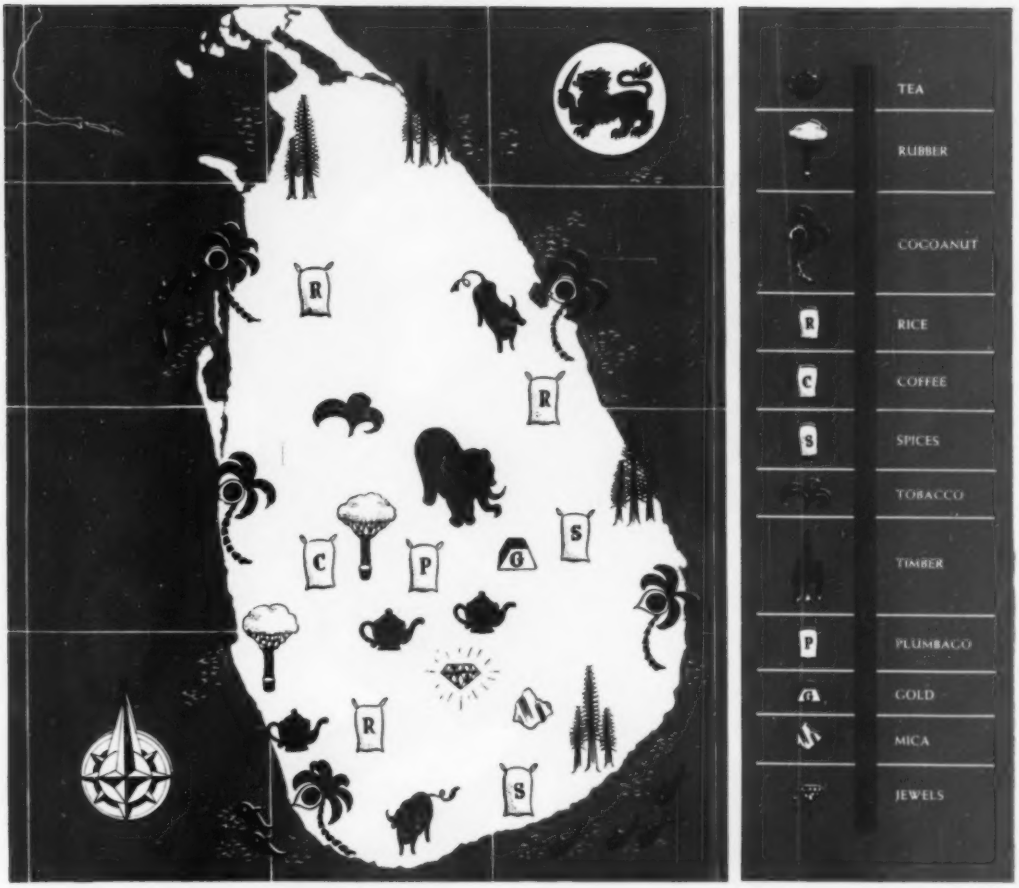
A. D. DUNLAP, Party Chief of crew 3, with 16 years of service to IX clients, got his first job on a seismograph crew before the ink on his Rice diploma was thoroughly dry. From September 1933, he worked his way up ... helper to shooter ... to observer ... computer, before his promotion to party chief. The average seismograph experience of an IX Party Chief is 15 years. His long continuous service with the Independent Exploration Co. organization, and natural aptitudes for exploration work typifies the skill and field work knowledge IX's clients find valuable.

They know their jobs from the ground down

Independent's experienced field crews can make your exploration program more profitable. The average experience of Independent's party chiefs is 15 years and every party chief is thoroughly trained in every phase of geophysical prospecting. The result is systematic field procedures, avoidance of lost motion, and thorough computation methods that give Independent clients unsurpassed accuracy and rapid service.

POINTING THE WAY IXO FOR THE DRILL

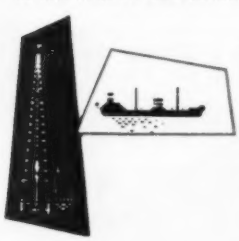
Independent
EXPLORATION COMPANY
Geophysical Surveys
ESPERSON BUILDING HOUSTON, TEXAS



DOMINION OF CEYLON

CEYLON . . . Bright gem in the Indian Ocean, this delightful island has long been admired for its scenery . . . its climate . . . its ancient temples. Ceylon's tea plantations are world-famous . . . its 25,000 square miles of fertile land also yield abundant rubber, cocoanut products, rice, coffee, spices, tobacco and timber . . . its minerals include plumbago, mica, gold and semi-precious jewels. Numbered among important post-war industrial developments in Ceylon are hydro-electric and irrigation projects, steel rolling mills, paper and fertilizer manufacture . . . as well as the expansion and modernization of other industries. Ceylon's 7 million people face the future with confidence.

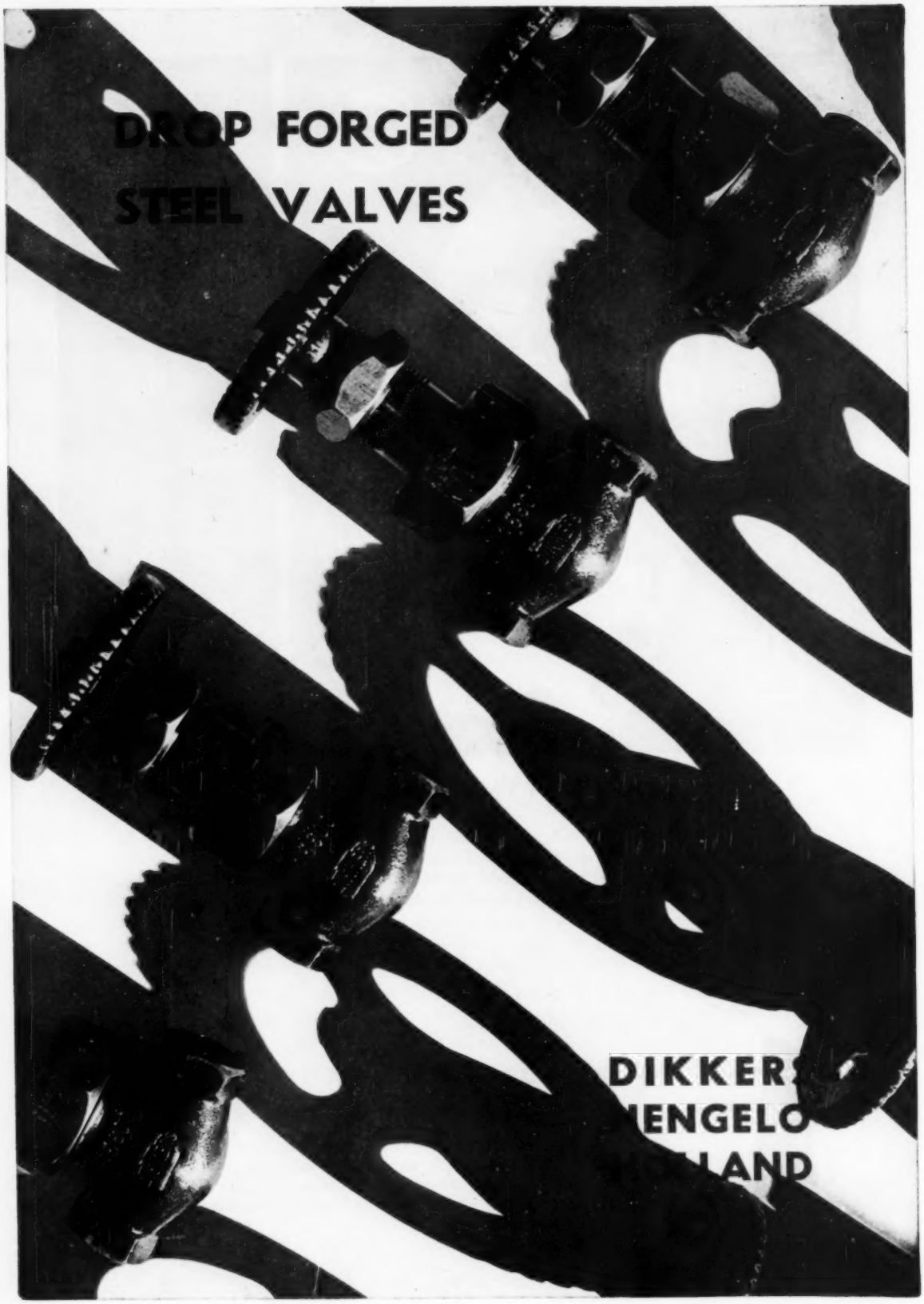
Standard-Vacuum is proud of the part it plays in supplying the petroleum products so essential to the welfare and continued growth of Ceylon.



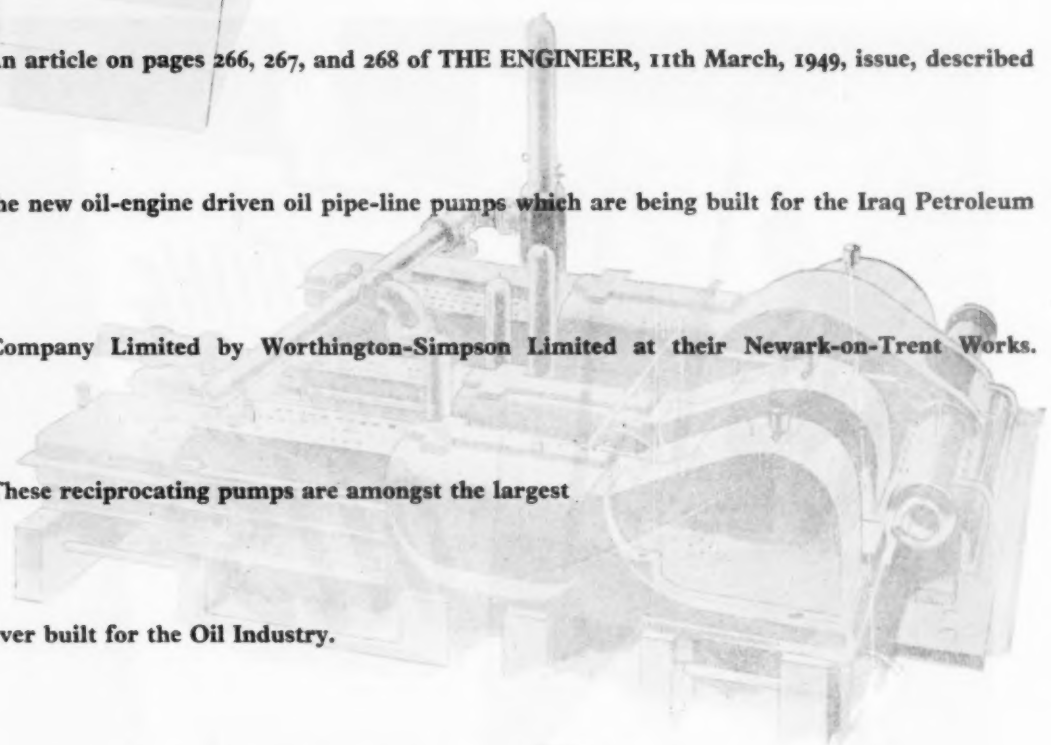
STANDARD-VACUUM OIL COMPANY

26 BROADWAY, NEW YORK 4, N. Y.

AUSTRALIA • BURMA • CEYLON • CHINA • INDIA • INDO-CHINA • JAPAN • KENYA
MADAGASCAR • MALAYA • MAURITIUS • INDONESIA • NEW ZEALAND
PAKISTAN • PHILIPPINES • PORTUGUESE EAST AFRICA • RHODESIA • SOUTH PACIFIC
ISLANDS • SOUTH-WEST AFRICA • TANGANYIKA • THAILAND • UNION OF SOUTH AFRICA


DROP FORGED
STEEL VALVES
DIKKER
ENGELO
LAND

An article on pages 266, 267, and 268 of THE ENGINEER, 11th March, 1949, issue, described the new oil-engine driven oil pipe-line pumps which are being built for the Iraq Petroleum Company Limited by Worthington-Simpson Limited at their Newark-on-Trent Works.



These reciprocating pumps are amongst the largest ever built for the Oil Industry.

The performance of the pumps is described in this extract from the article.....

"The designed output of each pump is 1,200 gallons of oil per minute, corresponding to 50,000 barrels per day, delivered at a pressure of 1,000 lb. per square inch."

The glands of the pumps are packed with SUPERSEAL NO. 3 Plasti-Metallic Packing supplied in pre-compressed ring form.

SUPERSEAL is one of the finest gland service packings manufactured. Supplied in five standard forms:

No. 2. For super heated steam, hot oil, gases where temperatures reach 600°F and above.

No. 3. For water, mild chemicals, oils, petroleum distillates and solvents where temperatures do not exceed 600°F.

No. 4. Non-metallic, for foods, fruit juices, edibles, etc.

No. 5. Non-metallic, for chemicals, caustic alkali, and acids.

No. 6. Non-metallic, for extremely high temperatures, steam or gases.

Supplied in spiral or ring form.

Send for a copy of our **Gland Service** *Recommendation Chart, now about to be published.*

Crane Packing LTD. OF SLOUGH ENGLAND

A COMPANY

Telephone: Slough 21334. Telegrams: CRANPAC, Slough.

Complete Marketing Service on a nation-wide scale for Producers, Refiners and Distributors of Petroleum Products, Natural Gasoline, Butane-Propane and Special Hydrocarbon Fractions.

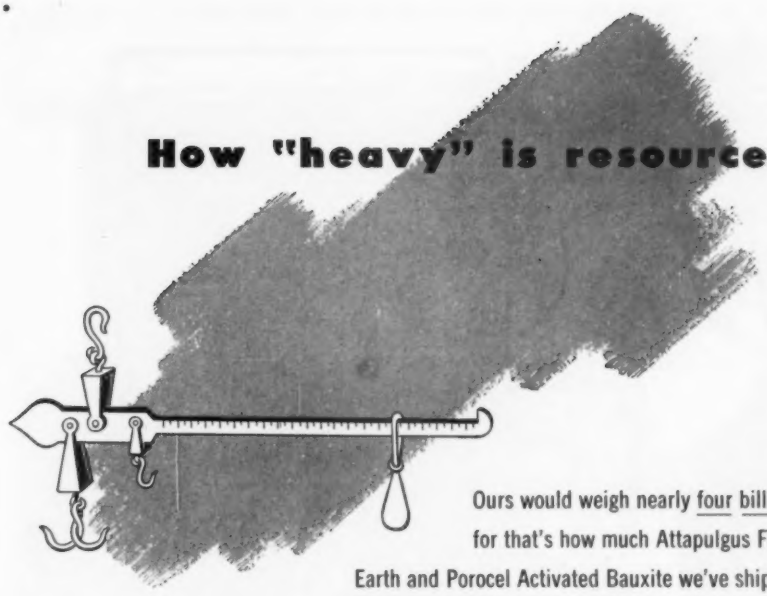
UNIVERSAL PETROLEUM COMPANY

Producers and UNIFUELS *Marketers of Petroleum Products*

Originators of UNIPLAN

NATIONAL BANK OF TULSA BUILDING
TULSA, OKLAHOMA

How "heavy" is resourcefulness?



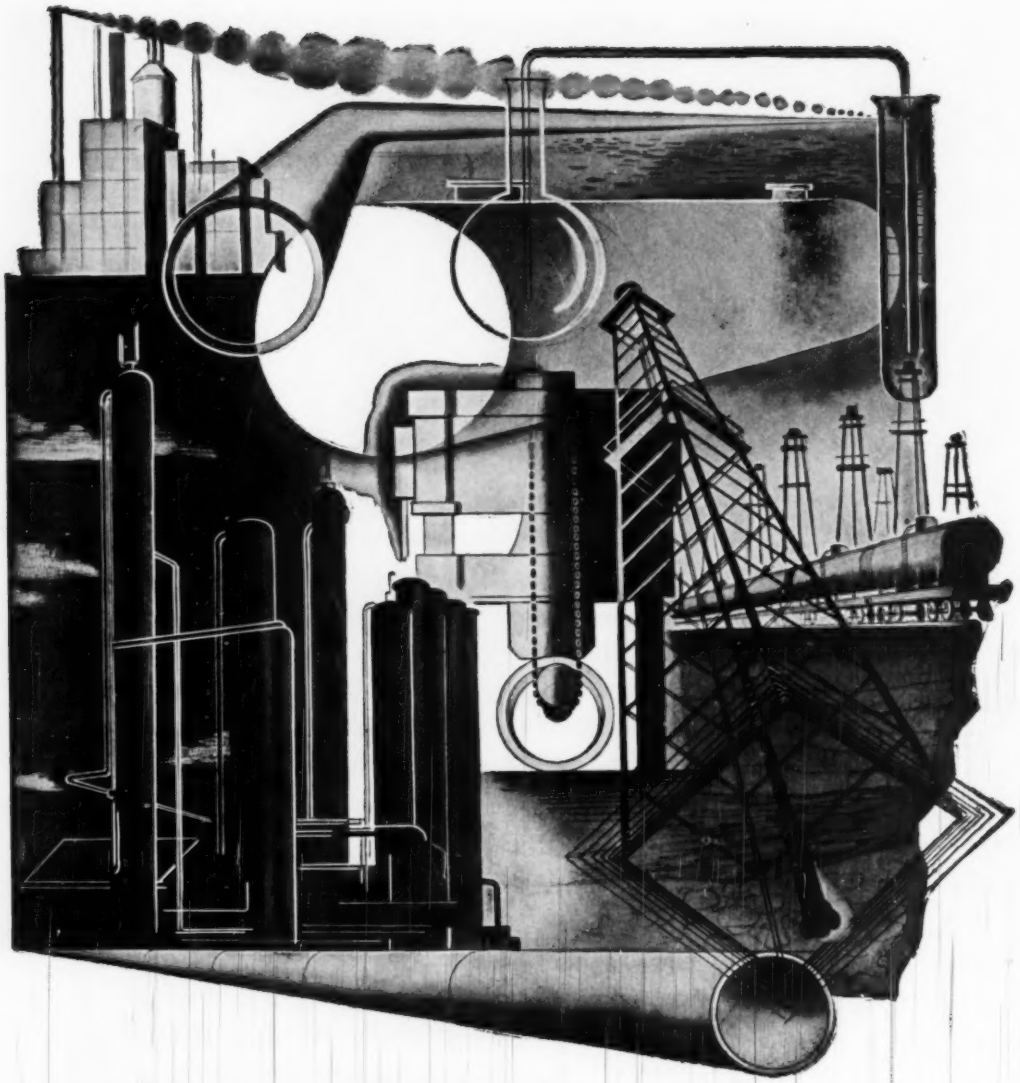
Ours would weigh nearly four billion pounds, for that's how much Attapulgus Fullers Earth and Porocel Activated Bauxite we've shipped to petroleum refiners.

When weighing resourcefulness—as it applies to percolation adsorbents and solid catalysts—two factors are particularly meaningful: First, the desire of all the people in the company family to tackle problems that require particular skill and broad technical knowledge. Second, the company's physical reach—mines, plant equipment, specialized laboratory and engineering facilities—for good men can do no more than their tools permit.

These resources abound at Attapulgus and Porocel. They dovetail to put a firm base under a completely integrated service. And—for world-wide petroleum refining—to put the right adsorbents to work under the right conditions.
May we be of service to you?

ATTAPULGUS CLAY COMPANY *Fullers Earth* · **POROCEL** CORPORATION *Activated Bauxites*

Dept. X, 210 West Washington Square, Philadelphia 5, Pa.



STEELS FOR THE PETROLEUM INDUSTRY

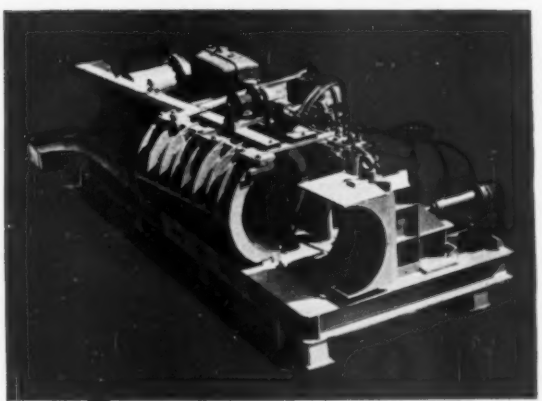
THE UNITED STEEL COMPANIES LTD

THE UNITED STEEL COMPANIES LIMITED

17 WESTBOURNE ROAD · SHEFFIELD 10 · ENGLAND

U.S. 31

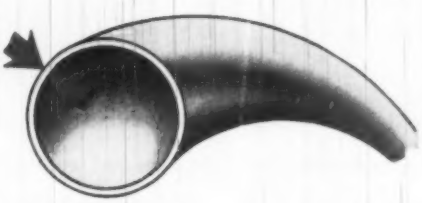
The Cinch Pipe Bender
is johnny on the spot



The Cinch Bender, a pipe bender that handles pipes up to 30" O.D. right on the job, saves you time, money and labor without effecting roundness or wall thickness of pipe. What's more, engineering and laboratory tests prove bends made by the Cinch Bender have improved yield and tensile strength. The Cinch Bender eliminates costly kinking and also eliminates the starting and stopping of machines so that cleaning and priming, doping and wrapping become one continuous operation. The Cinch Bender gives the owner the pipe line he desires —gives the contractor better production methods. Write for engineering details.

Bends pipe so that original strength is maintained or improved and pipe remains smooth and full-formed.

Wall thickness and roundness of pipe keep within the specifications for new straight pipe.



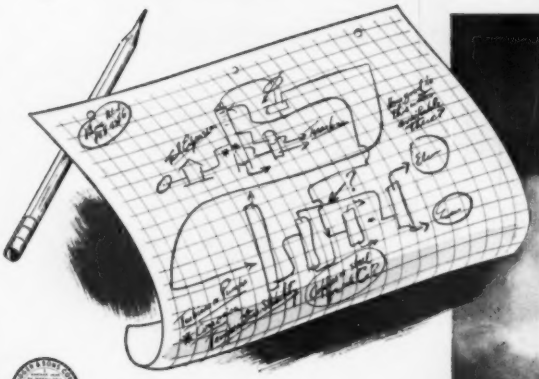
THE COODY BENDER CO., INC.

The 'Cinch Bender' makes pipe bending a cinch.

5709 HOLMES ROAD • PHONE YUKON – 5441-2-3

P. O. BOX 9271, CENTRAL PARK STATION
HOUSTON, TEXAS

from doodle to finished plant



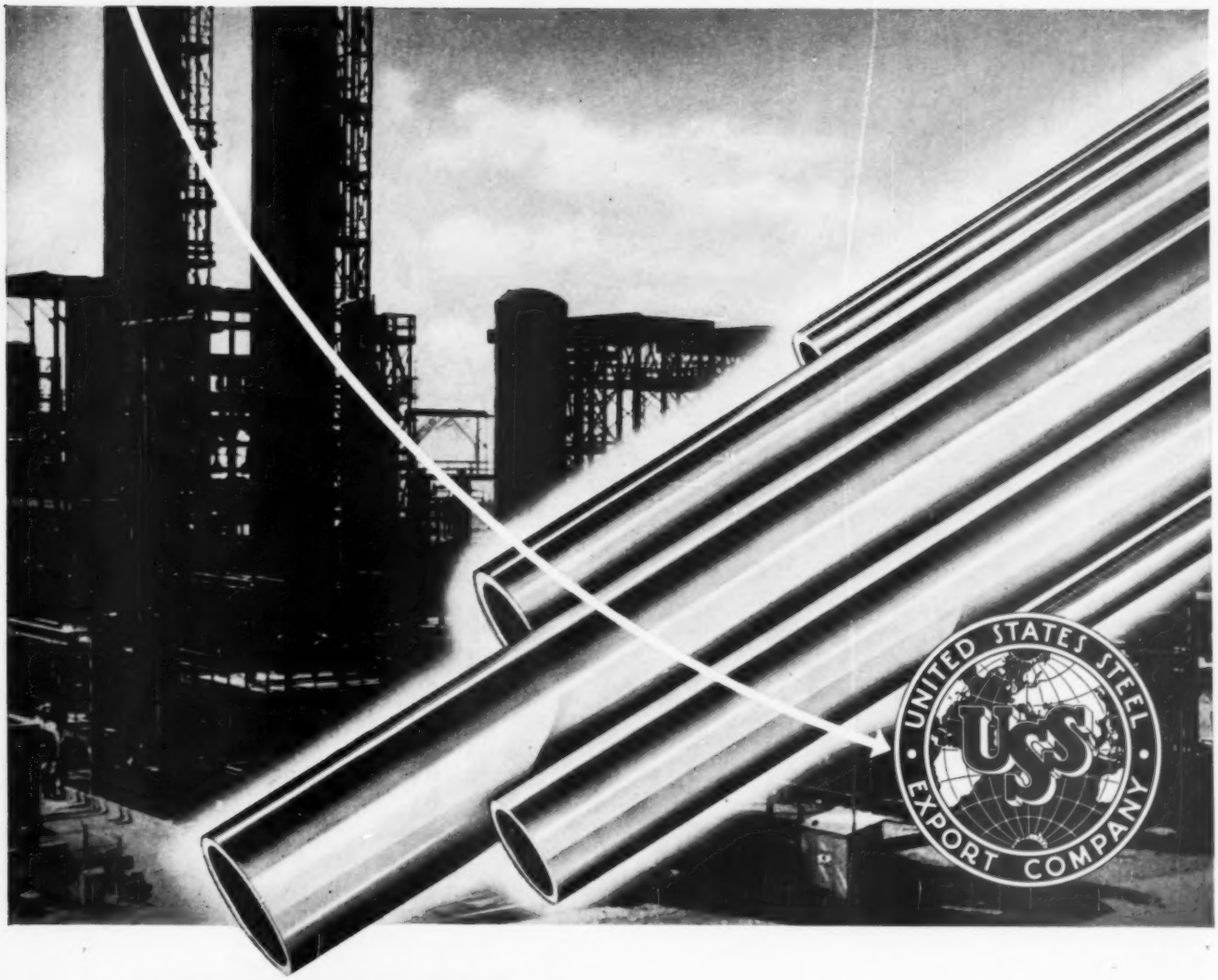
Whether you're planning to use a process still in the laboratory or one proved by years of commercial operation, Badger will develop with you its optimum application to your specific needs.

Badger's broad experience may thus be available during the planning and design stages of the project, and the responsibility for all phases of engineering, procurement of materials and erecting the plant are confined to one organization.

Badger believes that best results can be obtained by placing the responsibility for a process plant in one experienced organization and working in close cooperation and confidence with that organization . . . from the first "doodle" to the completion of the plant.

E. B. BADGER & SONS (Great Britain) LTD.
99 ALDWYCH · LONDON · W. C. 2.

PROCESS ENGINEERS and CONSTRUCTORS for the PETROLEUM, CHEMICAL and PETRO-CHEMICAL INDUSTRIES



U·S·S STAINLESS STEEL

—its high strength and corrosion resistance mean longer life for refinery equipment

Years of refinery experience have shown the superiority of U·S·S STAINLESS steel—for equipment that must operate at high temperatures and pressures under corrosive conditions.

U·S·S STAINLESS possesses outstanding resistance to such corrosion—has proved especially valuable in construction of trays and caps in bubble towers. Being light and strong, its use results in less breakage, less wasted tray area. Its smooth, dense surface means freedom from coking and fouling—longer runs and fewer interrupted operations for cleaning.

As a lining, U·S·S STAINLESS shows almost unlimited life in hot end service; many towers lined over ten years ago are still in successful operation. Even when handling sour crudes at 900° F. and higher, U·S·S STAINLESS linings reduce corrosion to a minimum.

In still tubes, ducts, containers, tanks, agitators, etc., U·S·S STAINLESS also provides unusual economy and durability—to a degree you have perhaps never before experienced. Specify it for new installations or replacements.

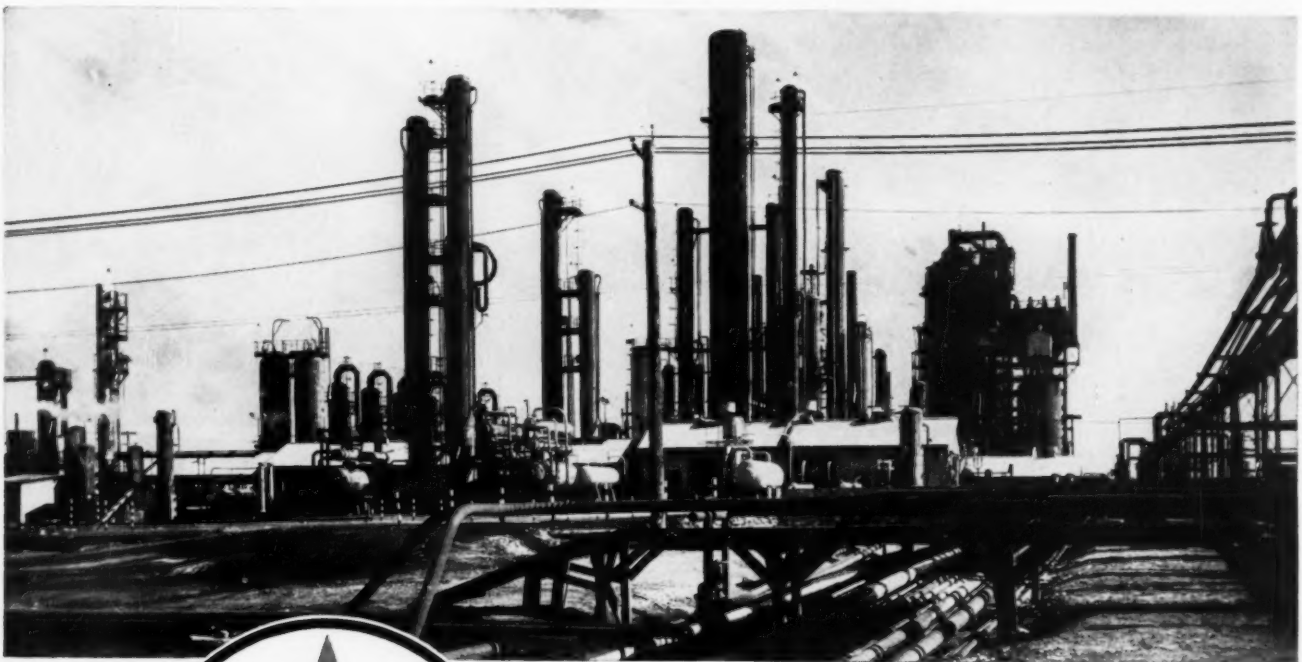
UNITED STATES STEEL EXPORT COMPANY

★ ★ 30 CHURCH STREET, NEW YORK 8, U. S. A. ★ ★

WE SERVE THE WORLD with superior steels from the world's largest steelmaker

MARINE FUELS
East of Suez

Section of Refinery at Bahrein, Persian Gulf—one of the many Caltex installations . . .



CALTEX
REG. T. M.

• CALTEX is accepted at an ever increasing number of ports. First, because of the high quality of its Fuel Oil and Diesel Oil. Second, because of its availability. And third, because at these Caltex Modern Ocean Terminals expert technical aid is also available. The result, when you specify Caltex—efficient, on-schedule, economical operations for all your vessels.

CALTEX PETROLEUM PRODUCTS

Offices in U.S.A.: *551 Fifth Ave., New York 17, N. Y. Cable Address:* **"CALTEX, N. Y."**

ELECTRICAL APPARATUS

FOR EVERY INDUSTRY

The General Electric Company manufactures complete electric equipment for the generation, transmission, distribution, and utilization of electricity—including not only the apparatus shown herein, but also hydroelectric-station equipment, engine-driven generators, meters, photoelectric relays, conduit and fittings, wiring devices, lamps, etc.

These products are distributed abroad through representatives of International General Electric Company, Inc., Schenectady, New York, U. S. A.

Any user who wishes help concerning electric equipment is invited to consult our engineers in any of the principal offices listed below, or to write direct to Schenectady, New York, for additional information on products listed herein.

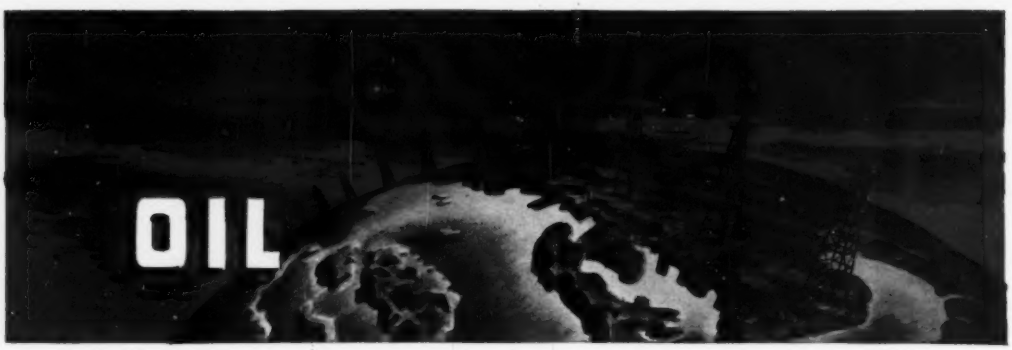
Australian General Electric Pty., Ltd., Sydney
Andersen, Meyer & Company, Ltd., Shanghai, China
Int. General Elec. Co. of N. Y. Ltd., Crown House, London, England
Int. Gen. Elec. Co. (India) Ltd., Thackersey House, Bombay
Int. Gen. Elec. Co., Inc. of Java, Batavia, N.E.I.
Int. Gen. Elec., S.A., Inc., San Juan, Puerto Rico
General Electric (P.I.) Inc., Port Area, Manila
So. African Gen. Elec. Co., Ltd., Johannesburg
Int. Gen. Elec. Co., Inc., St. John's, Newfoundland
N. E. & E. Co., Ltd., Wellington, New Zealand

INTERNATIONAL GENERAL ELECTRIC CO., INC.

New York, N. Y., U.S.A. Schenectady, N. Y., U.S.A.

GENERAL ELECTRIC

Presents . . . . . **EQUIPMENT FOR THE OIL INDUSTRY**



The Lorelei of industry, singing sweet songs of power to nations and to individuals, has lured the engineer and the business-man into the highways and byways of the world. The derricks of oil wells rise from lake and mountain, forest and desert as mute sentinels of man's economic progress.

Since the first oil well was drilled in Titusville, Pa., in 1859, the world has produced over 32 billion barrels of crude petroleum. Each year of the past few years has seen over two and one-half billion barrels produced, refined, and distributed. The drilling and pumping of wells, the refining processes of distillation, cracking, etc., the transportation of oil to and from the refinery, and the distribution of petroleum products by land and by sea today call for the use of nearly every type of electrical equipment.

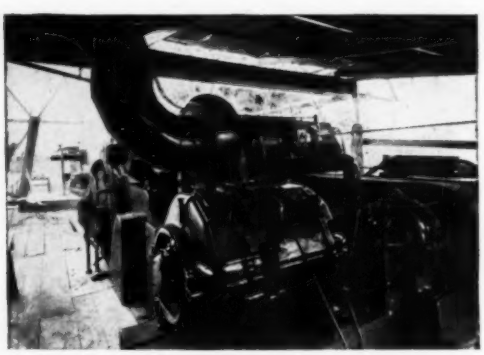
GENERAL ELECTRIC for many years has been a leader in the development of all types of electric equipment of outstanding quality and dependability for drilling, pumping, refining and transportation. Not only has the oil industry found that the G.E. monogram means assurance of reliability, but also oil men have found General Electric engineers ready at all times to co-operate in designing and applying electric equipment that would meet special conditions of service.

The General Electric Company manufactures complete electric equipment for the generation, transmission, distribution, and utilization of power in the oil industry. In addition to the apparatus listed, it builds steam turbines, turbine-generators, capacitors, switchgear, lightning arresters, oil circuit breakers, control equipment for all types of motors, meters, recording instruments, selsyns, copper-oxide rectifiers, heating devices, photoelectric relays, wire, conduit, etc.

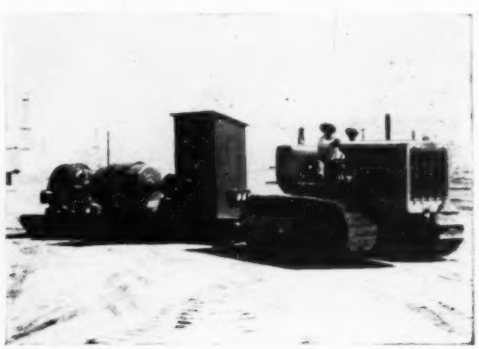
DIRECT-CURRENT ROTARY-DRILLING EQUIPMENT

The use of direct-current equipment for rotary drilling is one of the most modern developments in the oil fields. It provides the drilling rig with the extreme flexibility and highly efficient speed control afforded by direct-current motors, and with the same wide speed range and torque-speed characteristics as with steam-engine drive. The motors are operated by the well-known system of generator-voltage control, thus requiring direct-current generators at each rig. These may be driven by alternating-current motors, and thus operate from central-station power, or by internal-combustion engines, making the system highly desirable for locations not economically reached by electric-power service.

Equipment can be furnished with any capacity desired, from light rigs for shallow wells, to high-powered rigs for drilling by the most modern methods in deep territory.



G-E 700-hp (intermittent rating), direct-current draw-works motor, Type MDP, of Fain Drilling Co.

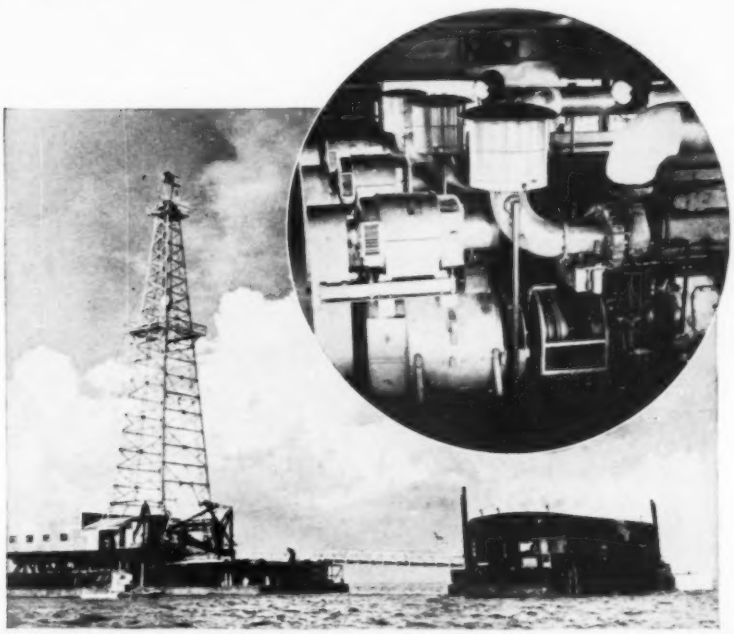


G-E portable generating set with control for d-c rotary-drilling rig.

[redacted] DRILLING EQUIPMENT [redacted]

Electric drive is especially suitable for off-shore drilling projects because of the relative ease of transmitting power electrically through flexible cables from the power barge to the drilling rig.

The diesel-electric rig combines the fuel and water economy of the diesel engine or turbine with the superior flexibility of control of the d-c electric drive.



The G-E engine governor control is one of the most outstanding features of the G-E control for engine-electric drilling rigs. Located on each engine, it provides for automatic reduction of the engine speed when drilling conditions permit. This contributes to reduced engine maintenance and longer engine life.

Three 500 KW G-E generators with top-mounted exciters driven by diesel engines with G-E governor control located on the power barge shown.

OIL-WELL PUMPING

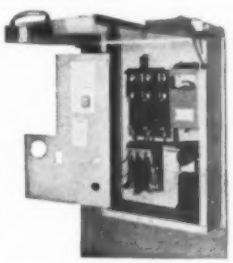
G-E well-pumping motor with control unit on pole.

With this new G-E motor-and-control team, you can coax along wells which do best when pumped slowly for long periods. You can step up the pace of those that can take it. In fact, you can tailor the pumping of any individual well to insure maximum life and yield.

You simply preset the proper pumping cycle on the G-E starter. Its built-in timing mechanism does the rest, automatically starting and stopping the pump. By eliminating the need for frequent supervision, one pumper can cover more wells and devote more time to other important duties.

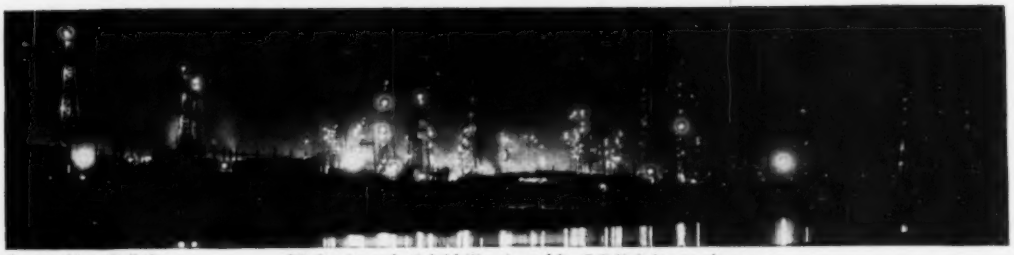
From the standpoint of pumping life, G-E splashproof motors also offer this definite advantage: they possess electrical characteristics which act to cushion the shock and strain of reciprocating motion. Moreover, mechanically, these motors are well protected from wear, weather, and electrical breakdown.

G-E application engineers are ready to help you in selecting motors and control to fit your specific conditions.



General Electric factory-assembled magnetic control, specially designed for oil-well pumping service, incorporates complete electrical protection for the motor, ample protection against weather, and provision for automatic intermittent operation of the pumping unit. Each control consists of a fusible disconnecting switch, a triple-pole magnetic switch with temperature overload relays, a manually reset under-voltage relay, a time switch, a "Hand-Off-Automatic" transfer switch, and a service protector against lightning, all enclosed in a weather-resisting cabinet arranged for pole or wall mounting.

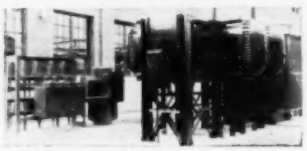
With this equipment, it is possible to pump intermittently for predetermined periods to meet proration or well requirements. This is done automatically by the proper setting of the time switch.



Courtesy of Lane Wells Co. Night view of oil field illuminated by G-E lighting equipment.

REFINING

2 G-E 5000-kw double automatic extraction turbines and switchgear. Atzcapotzalco Refinery, Mexico.



G-E outdoor explosion-proof unit substation. Atzcapotzalco Refinery, Mexico.

3 G-E 35-hp vertical, squirrel-cage motors driving circulation impellers in oil-cracking process.

Oil-refinery requirements are wide and varied. Pumps of every class, both high- and low-pressure, for oil, water, brine, acid, and oil products are in general use. Turbines, power station auxiliaries, fans and blowers, compressors, centrifuges, process machinery, automatic process timing control, Cottrell-precipitation apparatus, material handling equipment, yard locomotives, and car spotters are only a few of the host of applications in refineries. In oil refineries, continuity of power supply is an absolute necessity for maintaining operation of vital processes in order to minimize hazards and assure uniformity of products.

During the rapid growth of the petroleum industry, G-E engineers, trained in application and research, have assisted in many original developments and have kept pace with its evolution.

TRANSPORTATION AND MARKETING

Electric Welding Pipe Line

Oil tanker fully equipped with G-E electric equipment

Gasoline pump motor
(filling station)

G-E motors driving gathering and pipe-line pumps keep the oil and gasoline flowing through a large part of the country's pipe-line network.

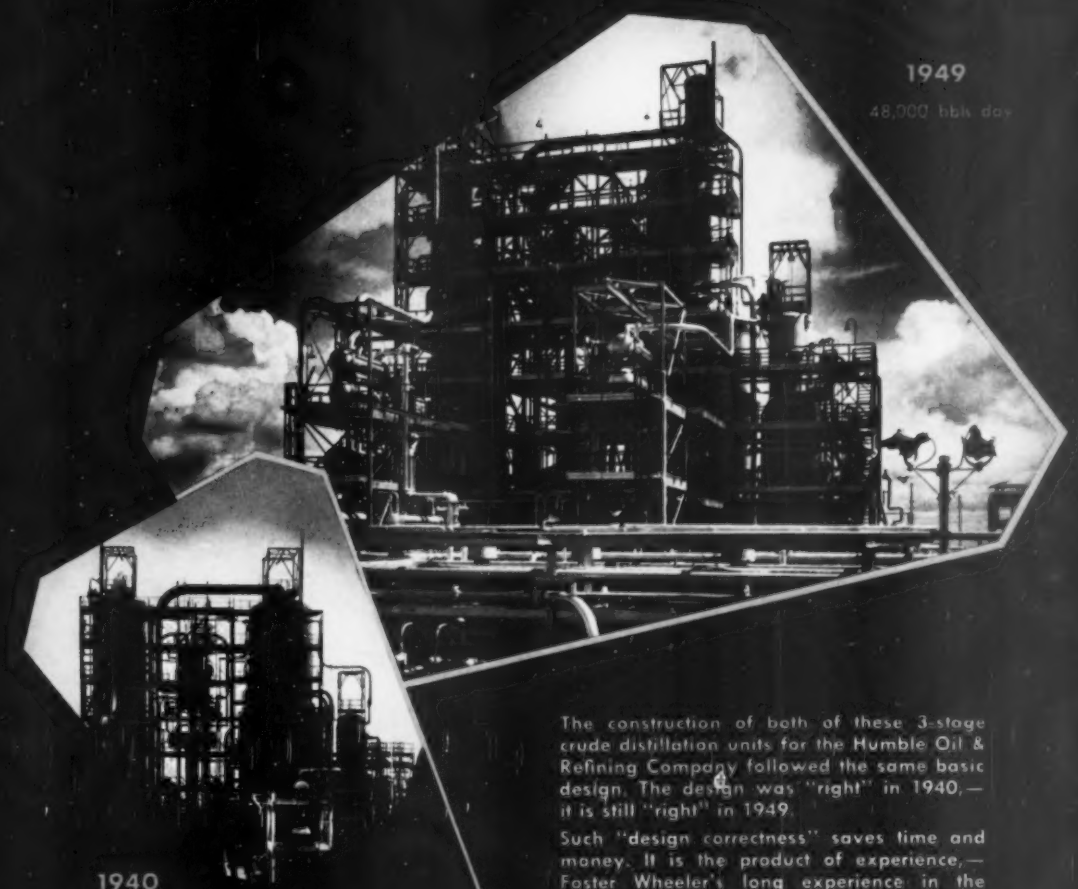
Many of the modern oil-tankers are powered with G-E equipment, including turbines, turbine-generators, motors, switchgear and control.

Hundreds of miles of pipe lines have been welded with G-E welders and electrodes, single-operator, direct-current welders, both motor and engine driven.

BULLETINS

Supplying the Nation's Oil Electrically	GED-825
Electric Equipment for D-c Engine-Driven Drilling Rigs	GEA-4456
Armored Mill Motors	GEA-4654
Electric Equipment for Aviation-Gasoline Refineries	GES-3147
Air Circuit Breakers in Explosion-Proof Boxes	GEA-3447
Unit Substations—600 v. and below	GEA-3592
Load Center Unit Substations For Semihazardous Locations	GEA-4085
Metal-Clad Switchgear up to 5000 v.	GEA-2249
New Limitamp Controllers	GEA-4247
New Low-Voltage Oil-Immersed Starters	GEA-3541
Air Break Explosion-Proof Starters	GEA-3704
A-c Arc Welders (English)	GEA-4081
A-c Arc Welders (Spanish)	IGE-S-3549
D-c Arc Welders (English)	GEA-1440
D-c Arc Welders (Spanish)	IGE-S-3544
Condensed Motor Catalogue (English)	GEA-4281
Condensed Motor Catalogue (Spanish)	IGE-S-3593
Synchronous Motors (Spanish)	IGE-S-3537
Tri-Clad Induction Motors (Spanish)	IGE-S-3543
Carboloy Tool Catalogue (English)	GT-475R
Carboloy Tool Catalogue (Spanish)	IGE-S-3556
Capacitors—Low Voltage Industrial	GEA-2742
Capacitors—High Voltage Industrial	GEA-2860
Diesel Electric Industrial Locomotives	GED-1113
Complete List of Publications covering Industrial Electronic Applications	IGE-3637
Steam Turbine-Generators	GEA-3277
Induction Motor Generators	GEA-3990
Novalux Floodlights	GEC-346
Automatic Process-Timing Control	GEA-4181
Co-ordinating Electric Pipe-Line Pumping Equipment	GEA-3858
Air Circuit Breakers	GEA-3642
Oil-Well Pump Starters	GEA-3805
Tri-Clad Open (Dripproof) Polyphase Induction Motors	GEC-264
Totally Enclosed Induction Motors with Surface Air Coolers	GEA-3109
Unit-Cooled Direct-Current Motor	GEA-4469
Thyrite Controlled D-c Generators	GEA-4471
Explosion-Proof Motors	GEC-221

design for growth



1949

48,000 bbls day

1940

30,000 bbls day

The construction of both of these 3-stage crude distillation units for the Humble Oil & Refining Company followed the same basic design. The design was "right" in 1940,— it is still "right" in 1949.

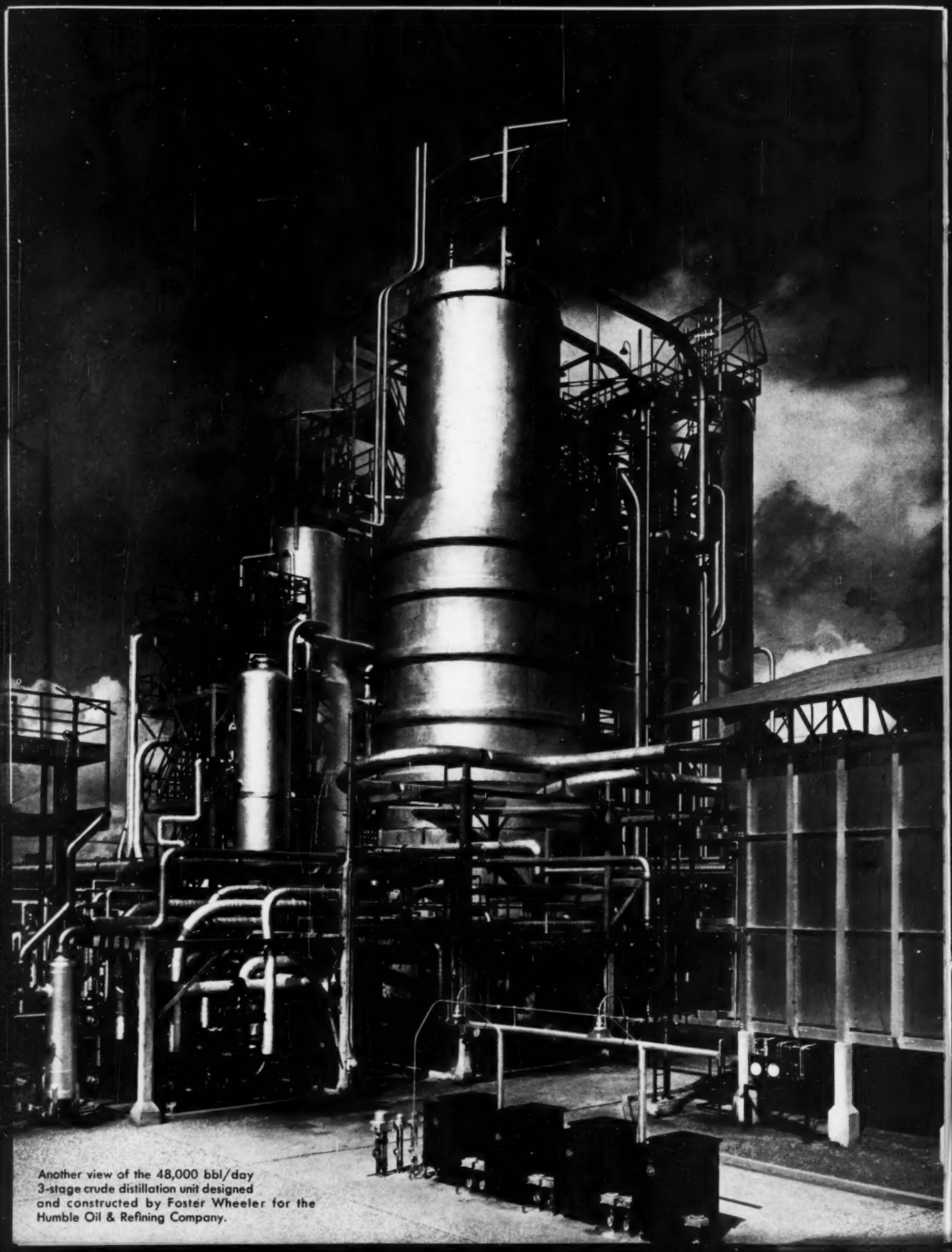
Such "design correctness" saves time and money. It is the product of experience,— Foster Wheeler's long experience in the building of over 500 process units for refiners in all parts of the world.

It is available to any refiner planning expansion or rehabilitation of refinery processing equipment.

FOSTER WHEELER CORPORATION

165 BROADWAY, NEW YORK 6, NEW YORK

FW



Another view of the 48,000 bbl/day 3-stage crude distillation unit designed and constructed by Foster Wheeler for the Humble Oil & Refining Company.

PACIFIC'S 1½" Stainless Steel Flanged End 150 lb. O.S. & Y. Gate Valve.

PACIFIC'S 1½" Carbon Steel Screwed End 600 lb. O.S. & Y. Gate Valve.

Presenting **PACIFIC'S** *New*

Stainless Steel - O.S.&Y. GATE VALVE - Bolted Bonnet

150 lb. Series — Flanged ends in sizes ½ inch thru 6 inch. Screwed ends in sizes ½ inch thru 2 inch.
600 lb. Series — Flanged and Screwed ends in sizes ½ inch thru 2 inch.

Carbon Steel - O.S.&Y. GATE VALVE - Bolted & Union Bonnet

Bolted Bonnet — 600 lb. Series—Flanged, screwed & socket welded ends in sizes ½ inch thru 2 inch.
Union Bonnet — 600 lb. Series—Screwed and socket welded ends only in sizes ¼ inch thru 2 inch.

PACIFIC VALVES INC.

WRITE FOR PACIFIC'S NEW STAINLESS STEEL BULLETIN AND CAST CARBON STEEL BULLETIN P.V. 49-10 ON THESE VALVES.

3201 WALNUT AVENUE — LONG BEACH 7, CALIFORNIA

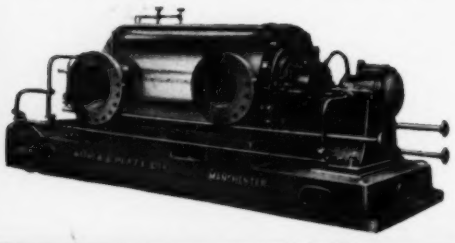
TELEPHONES — L.B. 60-5451; LOS ANGELES NEwcomb 6-2225 — TELETYPE — L.B. 8-8076; N.Y.C. 1-1077

BRANCH OFFICES: HOUSTON, TEXAS AND NEW YORK CITY, NEW YORK.

SALES OFFICES: SAN FRANCISCO, CALIF. — DENVER, COLO. — CHICAGO, ILL. — SEATTLE, WASH. — TULSA, OKLA. — CLEVELAND, OHIO — SALT LAKE CITY, UTAH — ST LOUIS, MO. — PITTSBURGH, PA.

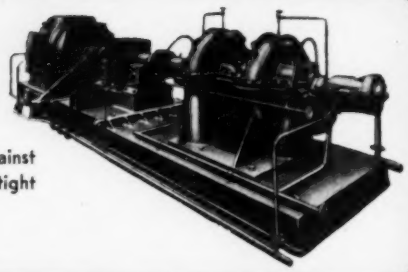
Centrifugal Pumps & FLAMEPROOF MOTORS

Main Pipeline Pumps....



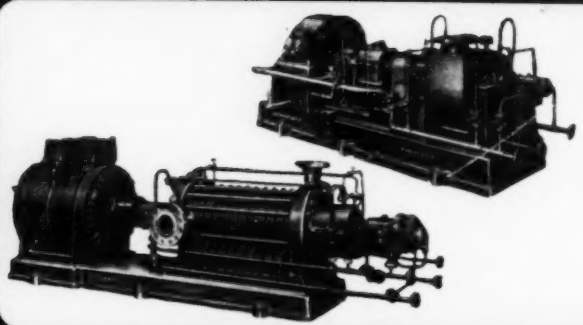
Mather & Platt multi-stage 'Plurovane' pumps were amongst the earliest centrifugal pumps installed for main line work. The pump shown on the left is a typical modern 'Plurovane' designed for a throughput of 50,000 bbls/day of crude oil against a pressure of 750 p.s.i. when running at 1500 r.p.m.

Transfer and Loading Pumps



Our standard ranges include a pump for nearly every transfer or loading duty. The two-stage "Medivane" pump illustrated on the right can handle 700 tons/hr. of crude or products against heads up to 500 ft. It is driven through a gas tight wallbox by a 550 h.p. Mather & Platt Motor.

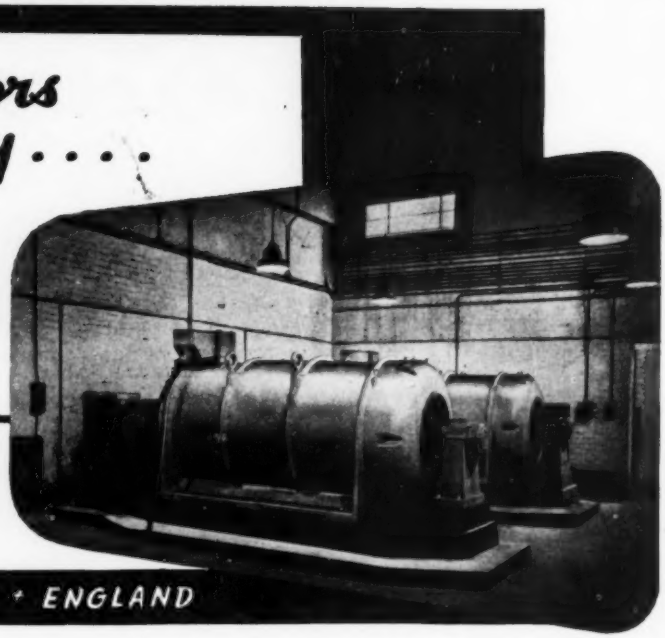
Refinery Process Pumps



Our long refinery experience at home and abroad enables us to supply pumps for the most arduous refinery duties. The illustration shows typical units:—a steam turbine driven pump handling oil at 500 degs. F. and a motor driven "Plurovane" pump dealing with light volatile hydrocarbons.

Flameproof Motors on Pipeline Duty....

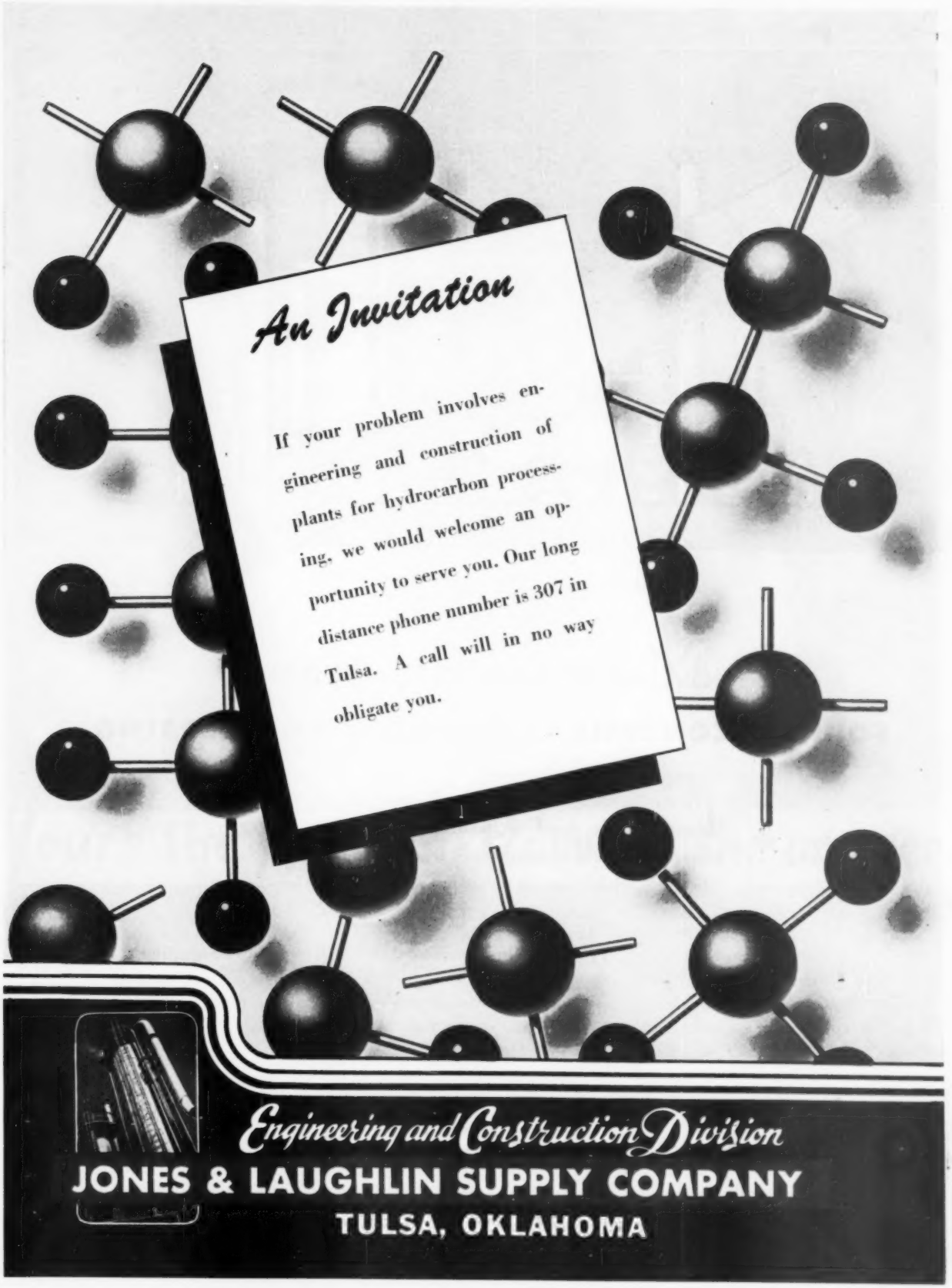
Mather & Platt electrically-driven centrifugal pumps on an oil pipe line. The motors here illustrated are of the totally enclosed flameproof type, and are of 1,000 h.p. capacity, fed from a 3 phase 50 cycle 6000/6600 volt supply. They are squirrel cage direct-on started machines with a starting current of four times full load value.

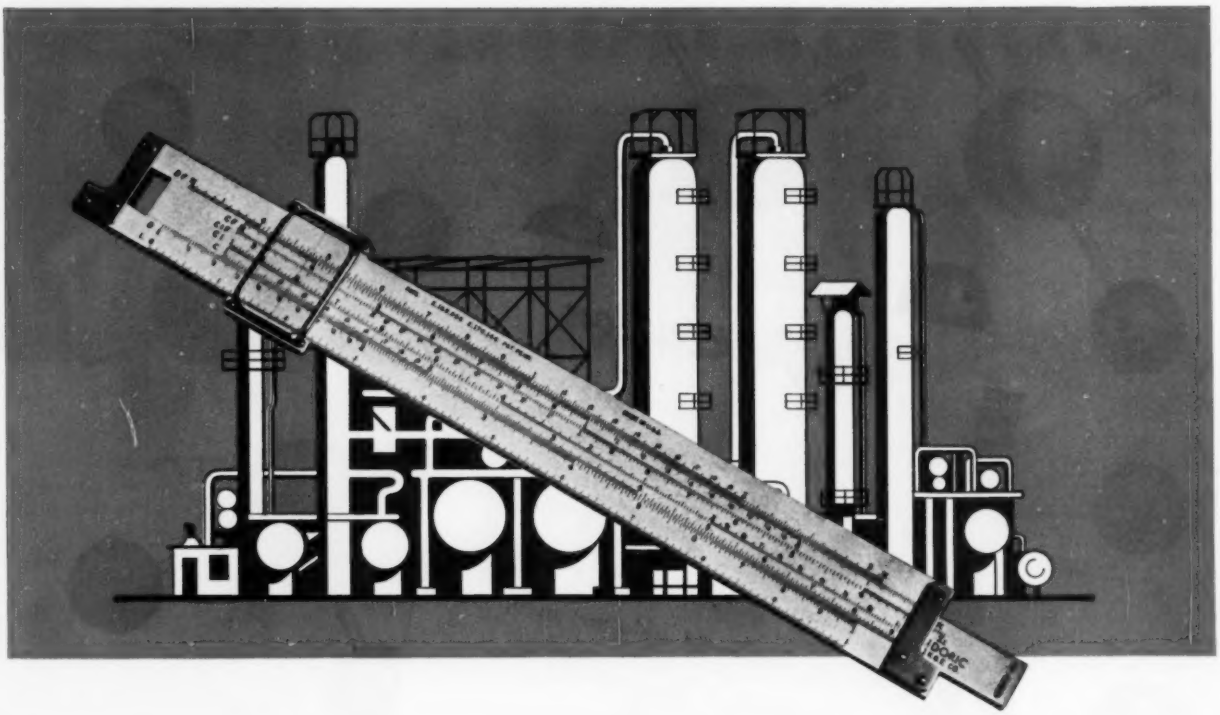


MATHER & PLATT

LIMITED

PARK WORKS · MANCHESTER, 10 · ENGLAND


An Invitation
If your problem involves engineering and construction of plants for hydrocarbon processing, we would welcome an opportunity to serve you. Our long distance phone number is 307 in Tulsa. A call will in no way obligate you.
Engineering and Construction Division
JONES & LAUGHLIN SUPPLY COMPANY
TULSA, OKLAHOMA



McKEE SERVICES MEAN
SOUND, ECONOMICAL REFINERY ENGINEERING

★ IN engineering and construction, efficiency and economy go hand in hand. You can't have true efficiency without economy—nor true economy without efficiency. McKee assures you both in these services: ★

1 Sound, efficient refinery engineering backed by many years of successful, world-wide experience.

2 Prompt and economical procurement of materials and equipment. McKee gets things on the job on time.

3 Rapid, *low-cost* construction by efficient field crews experienced in working together as one organization.

ARTHUR G. McKEE & COMPANY

DESIGN, ENGINEERING AND CONSTRUCTION FOR THE PETROLEUM REFINING AND IRON AND STEEL INDUSTRIES

ENGINEERS AND CONTRACTORS • ESTABLISHED 1905
2300 CHESTER AVENUE, CLEVELAND
30 Rockefeller Plaza, New York, N. Y.

TO THE CHEMICAL ENGINEER AND MANUFACTURING CHEMIST

Yours the problem - Harveys the answer!

Because Harveys specialise in the fabrication of Plant for the Industrial & Chemical Trades they can supply the answer to even the most complicated Plate work problem. Modern welding equipment and an experienced staff are available for the production of installations to any of the recognised codes, including A.O.T.C., Lloyds, A.P.I. and A.S.M.E. with if necessary, X-ray examination and stress relieving by heat treatment.

Harveys fabricate from mild or alloy steels, nickel and clad steel. Shop assemblies range from a few inches to 15 0" in diameter, pressures from absolute to 3,000 lbs. per sq. in.

If you have plant to be built, consult Harveys for all items of welded plate work. High grade designs can be developed from your specifications.

A typical example is the Electrically Welded Stainless Steel Autoclave, fitted with a Mild Steel Jacket, illustrated here. The inner shell has a diameter of 5' 0" and the Autoclave is 8' 5" high. This vessel was manufactured to Class 1 Specification with all welds X-rayed. Send for Catalogue WP 750.

Harvey

G. A. Harvey & Co. (London) Ltd. Woolwich Road, London, S.E.7

"SILVER FOX"
REGD. TRADE MARKS

"SILVER FOX"
STAINLESS STEELS

for

UTILITY

In the home, in industry, in engineering, transport, chemical plant, in scientific instruments and a host of other applications, "Silver Fox" Stainless Steels in their many different alloys exhibit the widest possible range of utility. For many purposes their bright decorative finish can be beautiful, too.

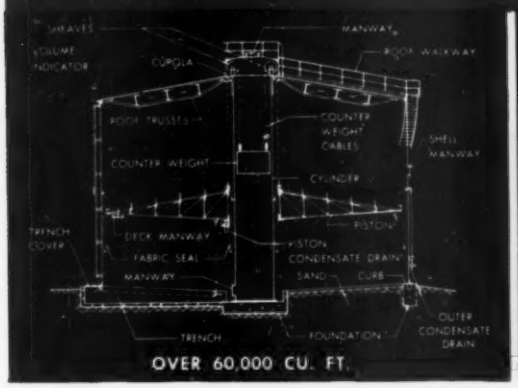
SHEETS · COLD ROLLED STRIP · WIRE · BARS · FORGINGS

THE UNITED STEEL COMPANIES LTD

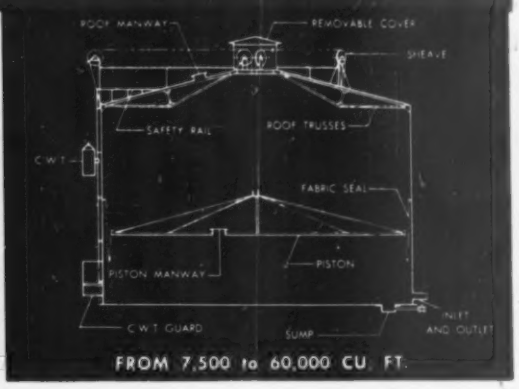
SAMUEL FOX & COMPANY LIMITED
Branch of The United Steel Companies Limited
STOCKSBRIDGE WORKS · NR. SHEFFIELD · ENGLAND

(RB) F233

WIGGINS Dry Seal GASHOLDERS



OVER 60,000 CU. FT.



FROM 7,500 to 60,000 CU. FT.

have proved a profitable investment,

because they offer . . .

1. A Gasholder with efficient operation and easy maintenance.

a. Not affected by snow load since all moving parts are under cover.
b. All major moving parts accessible for inspection during operation.
c. A vapor balancer that can be made gas free for repairs in a few hours.
d. A vapor seal that has a life equal to that of the tank.
e. A Gasholder working pressure of ⅛ to ¼ inch of water.

2. A vapor balancer that has a 100% Dry Seal.

a. Eliminates corrosion problems attendant with wet seals.
b. Requires no heating system during freezing weather.
c. Has no evaporation loss through a water or oil seal.
d. Requires no attention, adjustment or lubrication.

3. One vapor balancing mechanism for all tanks.

a. Provides flexibility of operation.
b. Permits repair of any tank in group without affecting operation.
c. Allows vapor balancer to be removed without disturbing storage tank operation.
d. Accomplishes all venting through one master valve.
e. One structure for protection of all standing and pumping loss.

WIGGINS CONSERVATION STRUCTURES

Hidek Floating Roof
Dry Seal Lifter Roof
Improved Breather Roof
Lodek Floating Roof
Dry Seal Gasholder
Improved Balloon Roof

For more complete details and Pay-Out Analysis, write for Bulletin VB-10

GENERAL AMERICAN TRANSPORTATION CORPORATION
135 SOUTH LA SALLE STREET, CHICAGO 90, ILLINOIS

WIGGINS VAPOR SEALS
GENERAL AMERICAN

Sub-Licensees

WESTERN STATES: Consolidated Western Steel Corporation, San Francisco—Los Angeles
SOUTHERN STATES: Wyatt Metal and Boiler Works, Houston—Dallas, Texas • CANADA: Toronto Iron Works Ltd., Toronto
GREAT BRITAIN: Motherwell Bridge & Engineering Co., Ltd., Scotland
FRANCE: Etablissements Delattre & Frouard reunis, Paris

What every new Tanker means to You

If you are a farmer it means bigger and better crops with better weed killers; constantly improved fuels and lubricants for trucks and farm machinery. And it means healthier, more productive livestock with effective insecticides.

If you are a housewife it means the comfort and convenience of modern heating and cooking . . . the lasting protection of better paints and preservatives . . . more efficient operation of the family car with modern gasolines and motor oils . . . health protection with new and better insecticides.

If you are a businessman it means quick, efficient transportation of goods; faster and more convenient travel by petroleum-powered automobile, train, ship, or plane.

The oil industry has been built on providing a better way of life through more and better petroleum products. It will continue to play a big part in the rising productivity essential to human progress and world peace.

The better you live, the more oil you use...

STANDARD OIL COMPANY (NEW JERSEY)

WORLD PETROLEUM

MANCHESTER OIL REFINERY (SALES) LTD

Manchester Oil Refinery (Sales) Ltd. has been formed to handle United Kingdom sales of all those products of Manchester Oil Refinery Ltd., which were previously distributed by the Subsidiary Companies:

PETROMOR LTD · PUREMOR LTD · and BRITISH TRANSFORMER OIL & LUBRICANTS LTD

The management and staff of the above companies, together with all existing facilities, will be used to operate the Sales Divisions of the new company. The Sales Divisions are:

LUBRICANTS DIVISION · TRANSFORMER OILS DIVISION · WHITE OILS DIVISION

CHEMICAL PRODUCTS DIVISION · WHOLESALE DIVISION

The decision to amalgamate the subsidiary companies into MANCHESTER OIL REFINERY (SALES) LTD. has been made in order to demonstrate clearly the intimate connection between the refinery and the sales organisation, and that the whole resources of the M.O.R. Group are behind the sales organisation. This step will result in a better service all round; the consumer, in particular, will benefit by having a direct link, through a central sales organisation, with a refinery operating in this country.
One of the features of the new organisation will be a technical service working from the refinery itself. Such a technical service guarantees complete personal attention to each customer by a staff of experts with many years of experience in petroleum technology, industrial processes and the problems of the lubricating oil trade.

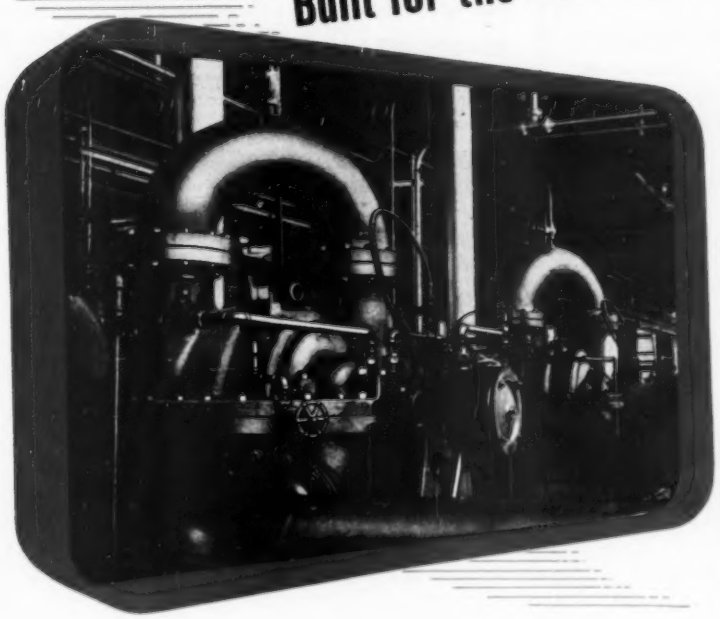
The products distributed by Manchester Oil Refinery (Sales) Ltd. include:

LUBRICATING OILS AND GREASES · TRANSFORMER OILS · VAPOURISING OIL
GAS OIL · FUEL OIL · TECHNICAL WHITE OILS · MEDICINAL PARAFFIN
PARAFFIN WAX · CUTTING OILS & COOLANTS *and Chemical Products, including :*
OIL- AND WATER-SOLUBLE PETROLEUM SULPHONATES · PETROLEUM AROMATIC EXTRACTS · SULPHONIC ACIDS, ETC.

MANCHESTER OIL REFINERY (SALES) LTD., TWINING ROAD, TRAFFORD PARK, MANCHESTER 17
and at 170 PICCADILLY, LONDON, W.1

THE M·O·R GROUP OF COMPANIES: BRITISH REFINED OILS

Built for the OIL and CHEMICAL Industries



Sigmund Process Pumps are designed to deal with difficult pumping problems, where extreme temperatures, high pressures, and corrosive and/or volatile liquids are to be handled. They are built to the specifications of the leading Oil and Chemical Companies throughout the world, and a comprehensive range of pumps is available.

SIGMA PROCESS PUMPS

Sigmund Solve your Pumping Problems!

Sigmund make pumps for all purposes and are specialists in the process pump field. Write *today* for details of your own requirements.

DA-1®

LEADS ACROSS THE COUNTRY

FLUID SYNTHETIC CRACKING CATALYST

Refineries specifying DA-1 (Synthetic Silica Alumina) are located in nearly every part of the country. Already, more DA-1 is used than any other catalyst of this type, and the number of users is increasing—influenced by the advantages offered by Davison's facilities, experience and service.

Davison's close laboratory control of production assures maximum catalyst utilization by maintaining a high standard of uniformity in physical, chemical and catalytic characteristics. DA-1 is available as . . .

F-1, FINE GRIND; C-1, INTERMEDIATE GRIND; C-2, COARSE GRIND

FACILITIES—Plants, strategically located in Baltimore and Cincinnati assure you of fast service from an established source of supply.

EXPERIENCE—You receive the benefits of our experience as builders and continuing operators of the first plant for the production of synthetic fluid catalyst.

SERVICE—You are always welcome to call upon our laboratory facilities for catalyst evaluation and trouble-shooting.

Consult Davison for the development of special catalysts in fluidized, granulated or pelleted form for your particular process . . .

WRITE FOR INFORMATION AND SPECIFICATIONS

THE DAVISON CHEMICAL CORPORATION

Progress through Chemistry

BALTIMORE-3, MD.

LESSON IN SIMPLIFICATION

Eliminate one round trip with this combination

PERFORATE AND TEST IN A SINGLE RUN

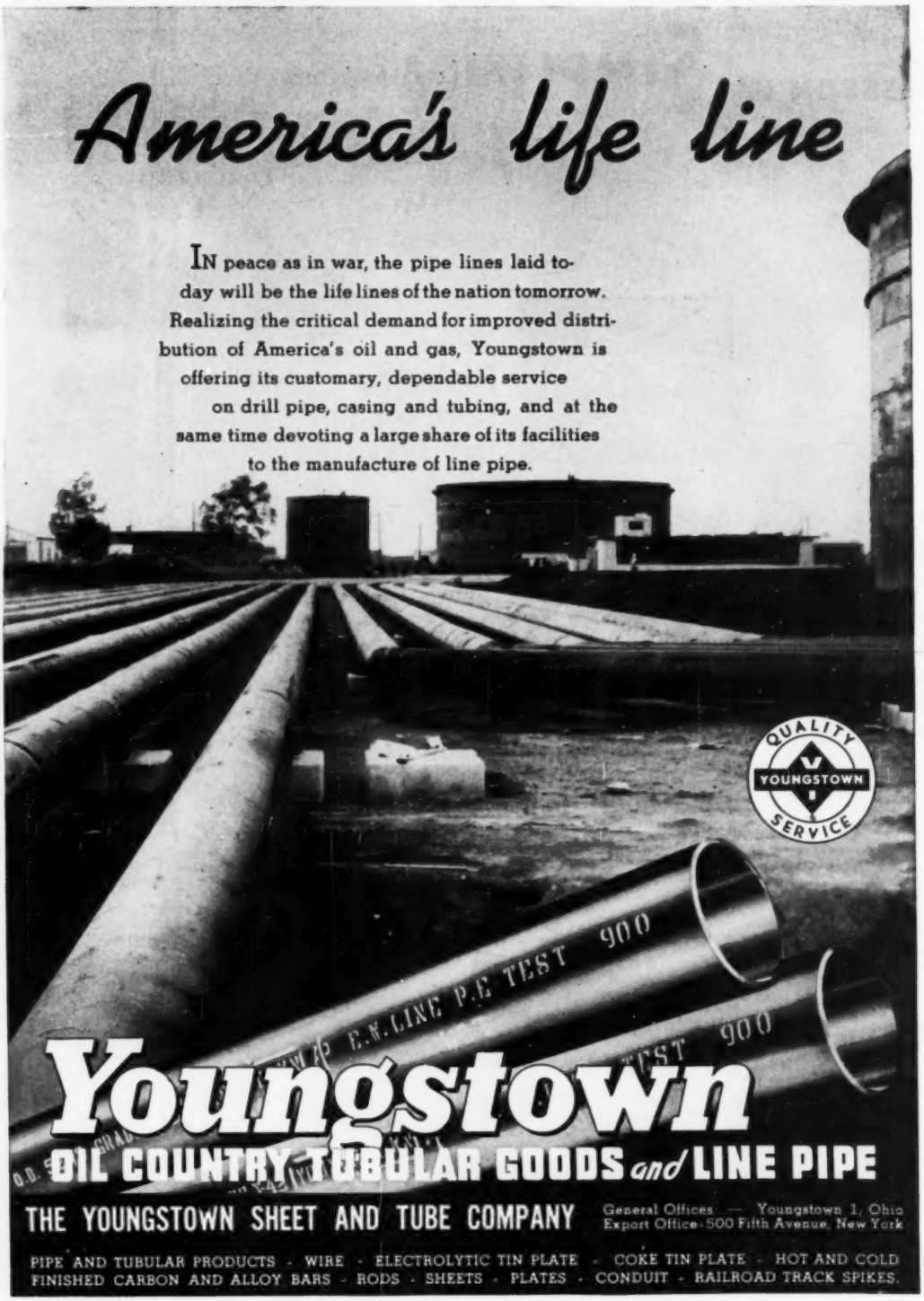
Saves wear and tear on equipment
Cuts many hours off completion
Gets well on production fast

M. O. JOHNSTON
OIL FIELD EXPORT CORPORATION
EXPORT SALES
3035 Andrita St., Los Angeles 65, Calif., U. S. A.
CABLE ADDRESS "MOJOC"

Write for descriptive literature!

America's life line

IN peace as in war, the pipe lines laid today will be the life lines of the nation tomorrow. Realizing the critical demand for improved distribution of America's oil and gas, Youngstown is offering its customary, dependable service on drill pipe, casing and tubing, and at the same time devoting a large share of its facilities to the manufacture of line pipe.



Youngstown

OIL COUNTRY TUBULAR GOODS *and* LINE PIPE

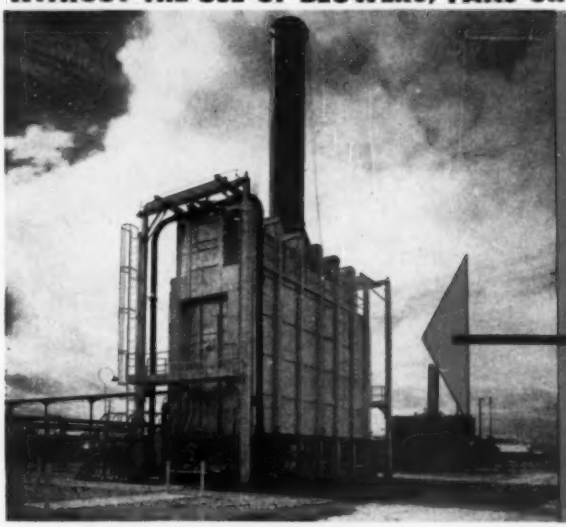
THE YOUNGSTOWN SHEET AND TUBE COMPANY

General Offices — Youngstown 1, Ohio
Export Office—500 Fifth Avenue, New York

PIPE AND TUBULAR PRODUCTS · WIRE · ELECTROLYTIC TIN PLATE · COKE TIN PLATE · HOT AND COLD FINISHED CARBON AND ALLOY BARS · RODS · SHEETS · PLATES · CONDUIT · RAILROAD TRACK SPIKES.

80% Heating Efficiency*

WITHOUT THE USE OF BLOWERS, FANS OR OTHER MECHANICAL EQUIPMENT



PICTURE AT LEFT SHOWS THE NEW BORN "UPFLO" HEATER at the WATSON REFINERY of the Richfield Oil Corp.

Operating Data

Stack Temperatures	640° F.
Furnace Temperature	1360° F.
Oil Temperatures	
Heater Inlet	339° F.
Radiant Outlet	601° F.
Oil Flow	828 Bbls/hour
Draft	
Stack	0.23"
Orsat	
CO_2	13.0%
O_2	3.0%
Excess air	16.0%
*Efficiency (H.H.V.)	79.8%
Efficiency (L.H.V.)	86.3%

Unbelievable . . . not when it's a Born "Upflo" Heater. Incredible . . . not at all. Just look at the operating data shown on the left.

Before building or remodeling an existing plant, call on Born and learn all of the many reasons why you'll do better with a Born "Upflo" Heater.

BORN Engineering Company

ENGINEERS and CONTRACTORS

TULSA, OKLAHOMA

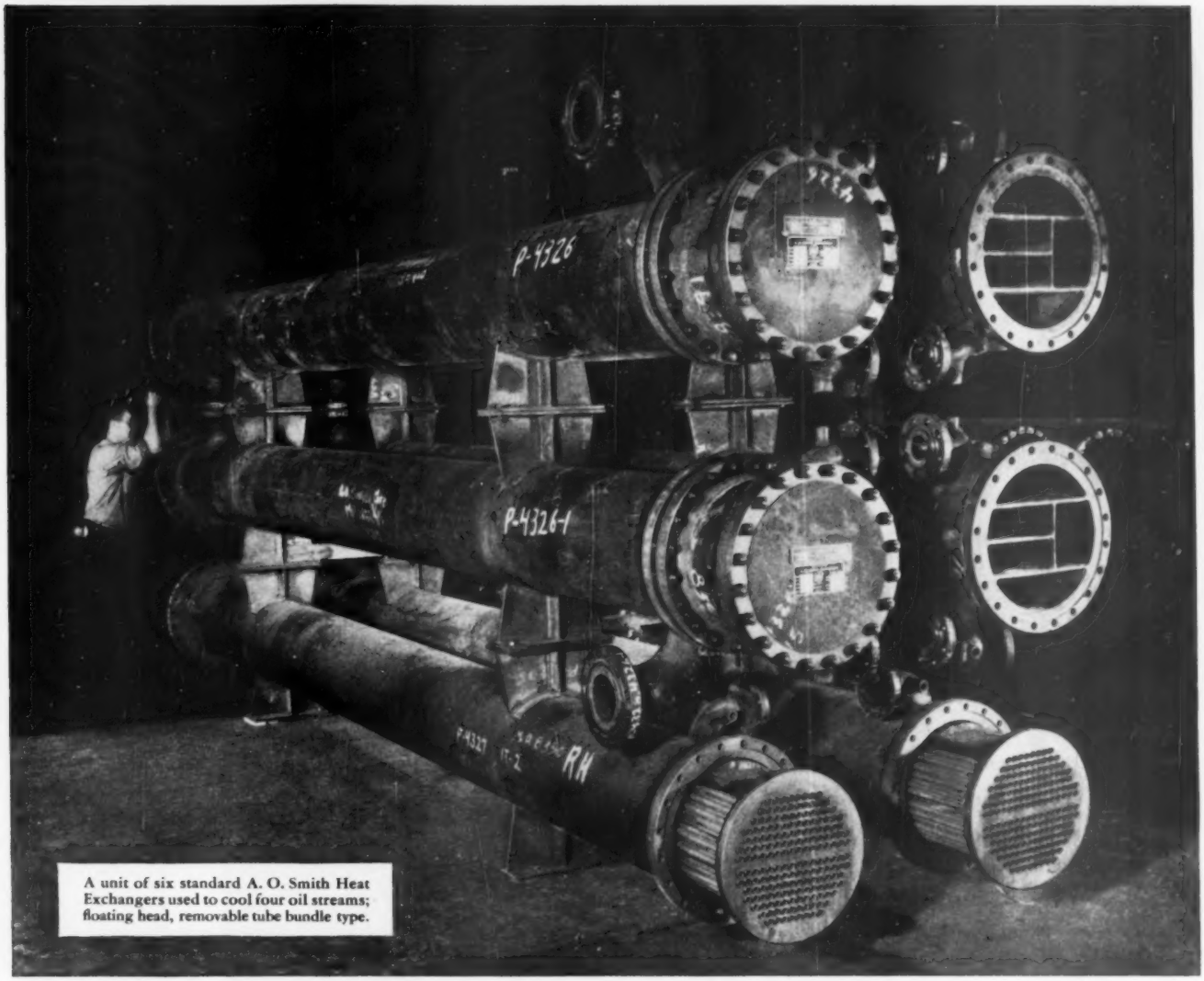
Representatives: LOS ANGELES, CALIF., G. R. Nance & Co. — SHREVEPORT, LA., Bass Sales & Equipment Co.
HOUSTON, TEXAS, Sales Engineering Co. of Houston, Inc.
Canadian Associates: BRANDON, MANITOBA, Canadian Brown Steel Tank Co., Ltd.

Unique

"Newallastic" bolts and studs have qualities which are absolutely unique. They have been tested by every known device, and have been proved to be stronger and more resistant to fatigue than bolts or studs made by the usual method.

C. P. Newall & Co., Ltd.

POSSILPARK GLASGOW · N



A unit of six standard A. O. Smith Heat Exchangers used to cool four oil streams; floating head, removable tube bundle type.

Your Most Important Specification

Progressive engineering, comprehensive research, and unique manufacturing methods developed through the making of more than seven million tons of welded steel products explain the world-wide A. O. Smith reputation for leadership in the design and construction of welded vessels.

This combination of techniques and facilities assures the utmost efficiency and dependability in A. O. Smith Heat Exchangers designed for standard and special applications in the petroleum, chemical, paper, and other industries. The fabrication of this equipment benefits from the accumulated years of experience in the manufacture of equipment for high-temperature, high-pressure, or high-stress services. SMITHway welding brings new freedom in design, flexibility in production, greater safety in operation.

A. O. SMITH PRESSURE VESSELS

HEAT EXCHANGERS • GLASS-LINED TANKS

Accumulators	Digesters	Kettles	Separators
Autoclaves	Flash Chambers	Retorts	Storage Tanks
Diffusers	Hi-Pressure Vessels	Scrubbers	Fermenters

Do your heat exchanger requirements call for intricate design . . . or the use of a wide variety of materials to suit special operating conditions? Whatever your problem, it will pay you to consult with A. O. Smith—first. Our long experience in welding, metallurgy, and alloy lining is your most important specification!

ASK US ABOUT A. O. Smith Multi-layer construction for your other vessel requirements. Multi-layer construction permits substantial savings in steel and freight costs while maintaining a high factor of safety.

A. O. Smith 75th Anniversary 1874 - 1949

A.O.Smith

CORPORATION

INTERNATIONAL DIVISION

P. O. Box 2023, Milwaukee 1, Wis., U. S. A. • Cable Address: SMITHWAY MILWAUKEE

Factories at Milwaukee • Kankakee • Houston • Toledo • Los Angeles

All those concerned with Fire Safety in the Oil Industry should . . .

This new brochure tells you how Mechanical Foam may be delivered to oil and spirit fires by the latest methods. It describes Mechanical Foam Branchpipes that produce fire-fighting foam at the end of the water line—Generators that make foam in the water line and force it through up to 400 feet of canvas hose or fixed pipe lines—Mobile, self-contained Foam Fire Tenders—Towers for delivering foam to oil tanks and Vapour Seals for spirit tanks. Every executive who is responsible for the fire safety of oil installations should obtain this book—Post the form below today for a free copy.

Get this important new booklet now...
MECHANICAL FOAM
An extract from the Handbook "Modern Fire Fighting"
Pyrene
THE PYRENE COMPANY LIMITED,
HEAD OFFICE AND WORKS, GREAT WEST ROAD, BRENTFORD, MIDDLESEX
SALES SERVICE AND EXPORT DEPTS.
9 GROSVENOR GARDENS, LONDON, S.W.1.

POST NOW To The Pyrene Company Ltd. Please send me a copy of your brochure "Mechanical Foam."

_____

_____

_____

W.P.

Pyrene TRADE MARK

The Pyrene Company Ltd., Sales and Service Dept., 9 Grosvenor Gardens, London, S.W.1, England.
(Phone: VICtoria 3401).

Associated with
The Pyrene Manufacturing Company of America

When the erection of a plant gets underway—most of the gains from efficient construction technique have already been won—or lost! Ultimate savings are largely set in the *planning* of the construction program—as to methods, schedules and labor requirements.

At Lummus, this planning is derived from unsurpassed 'round-the-world experience. Then, it is put into practice by a field staff to whom so-called "unpredictables" are old and familiar.

Sound technique, as Lummus applies it, means a sound night's sleep for those we serve who shoulder the responsibility.

LUMMUS designs and builds with

economy
fulfillment
resourcefulness
teamwork
TECHNIQUE
perspective

TECHNIQUE— in planning

The full effect of detailed planning in advance of actual construction has been realized in foreign work where local facilities are at a minimum. It called for scheduled arrival of tools and materials, periodic estimates of manpower requirements and the preplanning of specific procedures for materials handling and heavy lifts. Economy in requirements for construction facilities, tools and equipment by preplanned re-use at various construction stages is one example. The selection of a supervisory staff with experience permitting effective reassignment as the job progresses is another.

TECHNIQUE— on the job

What makes it possible to move a 150-ton derrick intact from one tower-erection location to another, as contrasted to disassembly and reassembly? Planning—plus practical experience of the field staff on the job! Lummus field personnel has served in some 15 foreign fields, as well as at home, and averages better than 10 years' Lummus experience.

TECHNIQUE— as to costs

From an analysis of unit erection costs in which every man-hour is estimated in advance, Lummus lays the groundwork for continuing cost control. Periodic reports, detailing costs and work-progress, permit evaluation of all phases of the job from start to finish.

THE LUMMUS COMPANY
420 Lexington Avenue, New York 17, N. Y.

LUMMUS

CHICAGO—600 South Michigan Avenue, Chicago 5, Ill.
HOUSTON—Mellie Esperson Bldg., Houston 2, Texas

The Lummus Company, Ltd., 525 Oxford St., London, W-1, England

Société Française des Techniques Lummus
39 Rue Cambon, Paris 1er, France

Compañía Anónima Venezolana Lummus—Edificio "Las Gradillas"
Esquina Las Gradillas, Caracas, Venezuela

WORLD PETROLEUM

Founded by Russell Palmer

PUBLISHED BY MONA PALMER

THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

E. W. Mayo
Editor

J. C. Chatfield
Managing Editor

Richard Sala
Art Director

SUBSCRIPTIONS

Annual subscription $5.00 (U. S.) postpaid
Single copies 50 cents

GENERAL OFFICES

2 West 45th Street, New York 19, N. Y.
(Tel. MUrray Hill 2-7333)

BRANCH OFFICES

LONDON: E. H. Doddrell, 342, St. Paul's Corner, Ludgate Hill, London E. C. 4 *(Tel. CITY 5318)*

LOS ANGELES 14: W. S. Johnson, Western Advertising Manager, 412 West 6th Street, *(Tel. Mutual 1391)*

NEW YORK 19: E. L. Townsend, Eastern Advertising Manager, 2 West 45th Street, *(Tel. MUrray Hill 2-7333)*

TULSA 3: O. F. Cozier, Mid-Continent Advertising Manager, 515 McBirney Bldg., *(Tel. 4-5555)*

World Petroleum is published by Mona Palmer, Trustee under the will of Russell Palmer

CONTENTS

VOLUME 20 NOVEMBER 1949 NUMBER 12

The Question that Demands an Answer 43
Neutral Zone Exploration to Operate from Floating Base in Persian Gulf 44
90 Years of Progress 47
Oil Information Committee Increases Pace of Public Relations Program .. 52
Dakota and Muddy Strikes Step Up Denver Basin Play 54
Drilling and Production Practice in Oil Fields of South Iran 58
Second Modern Billings Refinery Completed 63
Unusual Design Features YPF Crude Topping Unit, La Plata Refinery, Argentina 66
Strategic Importance of Oil Studied 68
Moderate Increase in Imports Forecast in Ten Company Survey 70
Present Conditions Endanger Growth of Automotive Transportation 72
Chemicals from Petroleum 78
International Notes 82
Oil Company Changes 84

This Month's Cover

Vernon Howe Bailey, whose work appears in art museums in this country and abroad, visited Port Socony, Staten Island, N. Y., the largest petroleum marine terminal on the East Coast, to produce this water-color for the *Socony-Vacuum News*. The tanker in the foreground has been unloaded and is ready to leave for a distant port to take on another cargo. Color plates are reproduced through the courtesy of Socony-Vacuum Oil Co., Inc.

ACE IN THE HOLE

HOWCO

DV

MULTIPLE STAGE TOOL

PERFORMANCE in many wells, under many conditions, definitely establishes the DV Multiple Stage Cementer as an ace in any hole requiring multiple stage cementing operations... A novel application of hydraulics introduces new effectiveness in placing cement where required with minimum pump pressure ... Especially valuable in full-depth cementing and in cementing off formations—adaptable to many other applications...Consult your nearest Howco representative.

HALLIBURTON OIL WELL CEMENTING COMPANY

DUNCAN, OKLAHOMA

EDITORIAL

THE QUESTION THAT DEMANDS AN ANSWER

UNDOUBTEDLY the most important question which the United States as a nation must decide in the near future is the direction which its politico-economic course is to take, not for an emergency period or for the life of a single political administration, but through a time as long perhaps as the nation itself shall endure. It is not the concern of any one class or section or industry. It does not apply to oil men more directly than others, except perhaps for the fact that their industry has grown to the extent where it ranks second only to agriculture in its vital relationship to the industrial progress and continuing prosperity of the country. It is, in short, the personal problem of every citizen, though few of them appear to realize its individual applicability.

It is difficult even to define the issue briefly and exactly because there is a very broad lack of agreement as to the ultimate objective or as to the bearing of almost any specific proposal on the attainment of a definite end. In general it is an issue between individual initiative and planned economy (government planning), between free enterprise as it existed for a century and a half in America and a growing limitation upon private or corporate activity through an entity created by the approval, or more often through the inertia, of the citizenry themselves, which now threatens to become their master.

There is no sharp dividing line, no Iron Curtain, separating measures needed for the protection of the individual and those that unnecessarily hamper his ability to advance the common welfare while striving for his own success. Looking over the record of the past century or more, it is easy to see how far we have traveled from the pioneer period when men had to prove themselves masters of their own fate or succumb to the natural obstacles surrounding them. The primitive community required no policeman; every man stood ready to defend his own. As population grew, people were brought into closer contact. The invention of new machines and the development of mass production made them more interdependent, and it became necessary to establish broader authority to prevent the use of unfair methods in the competitive struggle.

Following the record further, we see how, for fifty years or more, the efforts of federal and state governments were directed to the preservation of the competitive system by the enactment of laws to protect the weak against the strong and to forbid the use of unscrupulous devices by which huge organizations might make it impossible for those of lesser resources to survive—the "trust busting" era.

It is possible too to note the point at which a new element was introduced when some of the agencies established to enforce fair play, themselves grown great through the growth of business, became dissatisfied with the role of umpire and conceived the idea that they could direct industry more capably than the men who had built it up and made this nation the world's leader in the industrial field.

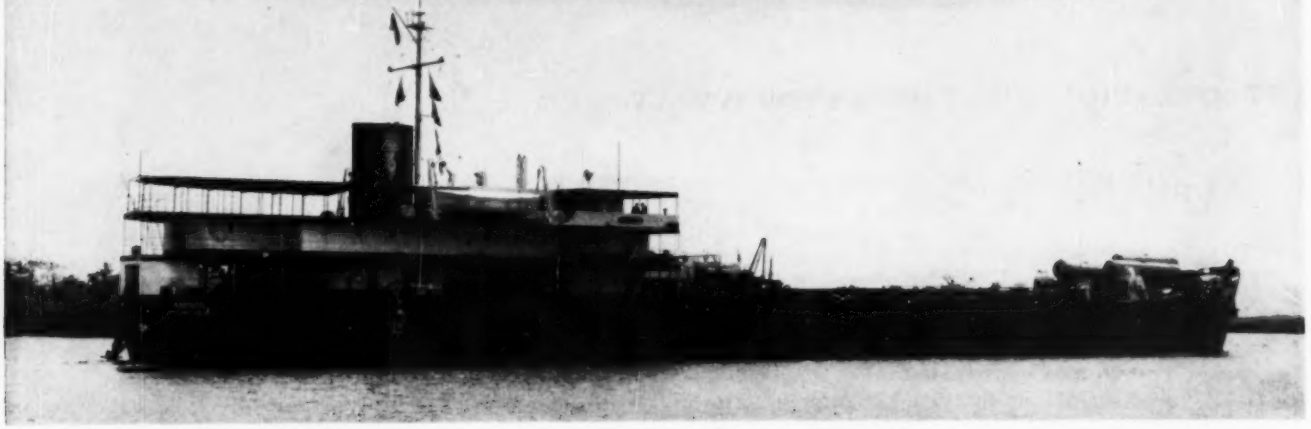
Here emerged the economic planner, long on theory though usually short on practical experience, who pointed out that there were great wastes in competition and that if production, distribution and prices could be determined by men with slide rules sitting in Washington, shortages, surpluses and the ups and downs in consumers' cost could all be eliminated, or at least nullified in effect by governmental action. Despite the fact that this system never has worked successfully, even under the most autocratic governments, the theory behind it unquestionably has gained many adherents in the past two decades.

Professional politicians were quick to realize the possibilities thus presented for ensuring the perpetuation of partisan power. The development of a vast organization with millions of employees to operate its controls provided a huge nucleus of party support, while other large groups could be attracted by the promise of special favors. Subsidies and privileges could take the place of the bread and circuses of ancient Rome.

If a poll of the American people were conducted on the single question, "Do you prefer a free enterprise system or the control and management of all industrial activity by government?" there is no doubt that the response would be overwhelmingly in favor of the traditional American way. The issue, of course, never is presented in that bald form. The proponents of centralized control realize that they can make progress, if at all, only step by step. They couch their proposals in attractive terms, such as the "fair deal", the "welfare state", the "age of security".

There is one effective test that can be applied to any proposal to magnify the authority of the state under the guise of benefiting the individual. "Does it weaken the worker's incentive to produce?" "Does it discourage the investment of new capital which is the life blood of industrial progress?" If it does either of those things, it is in reality an axe laid at the root of the American way of life.

NEUTRAL ZONE EXPLORATION TO OPERATE FROM FLOATING BASE IN PERSIAN GULF



EXPLORATION of the Neutral Zone between Saudi Arabia and Kuwait by American Independent Oil Co. and Pacific Western Oil Co. will become active within the next few weeks. Supplies and equipment for the first year's field operations were shipped from Orange, Texas, on September 30 and are expected to arrive at the site of operations on the Persian Gulf about November 21.

A noteworthy innovation in the exploration of distant areas has been adopted by Ralph K. Davies, president of American Independent, and his associates in the new enterprise. For the preliminary work at least, a leaf has been taken from the notebook of the developers of tideland properties on the American Gulf. Instead of shipping large quantities of building materials for the construction of a base camp some 12,000 miles away, the base camp was built in Texas and is being floated to the Neutral Zone complete and ready for operations. Now it will be unnecessary to send an advance crew of construction men to build the camp, and months of preparatory delays will be eliminated and very large unproductive preliminary expense will be avoided.

Under the American Independent plan a floating headquarters will be anchored offshore in the Persian Gulf, and field men, geologists and operating managers will live in unusual air-conditioned comfort and commute to the field by motor boat and truck. It will be possible to move the base camp to the most convenient offshore location whenever field operations are shifted, thus keeping employee travel time at a minimum. This may well be an important item in the effective exploration of the 2,500-square-mile area which the concession embraces. Possibly the most important element in the plan will be the greater efficiency which should be attained by providing exploration employees with fine, comfortable quarters in a climate which is rigorous for those not accustomed to it.

The 2,600-square mile Neutral Zone lies just south of the Burghan field, reputed to contain the largest reserves of any known field.

The LST 1014 as delivered to Levingston Shipbuilding Corp. for conversion.

American Independent Oil Co. was granted its concession by the Sheik of Kuwait in 1948 for a term of 60 years. Pacific Western Oil Co. was granted a concession on the Saudi Arabian portion of the zone, claim to which was relinquished by Arabian American Oil Co. By agreement between the two concessionaires, American Independent will do the development work for both companies. The active field operations will be under the management of James MacPherson, who has been familiar with the Middle East for more than 30 years, beginning with his service in the British Expeditionary Forces in Palestine and the Sinai Peninsula in World War I. He was vice president and resident manager for Arabian American Oil Co. during the development of that company's properties in Saudi Arabia but resigned a few months ago to head up the American Independent operation.

To effectuate its plan for a floating headquarters American Independent purchased the LST 1014 from the Navy and turned it over to the Levingston Shipbuilding Corp. at Orange, Texas, for conversion into the floating base. When the converted LST, renamed the MV Aminoil, sailed for the Neutral Zone on September 30, its 3,000-ton cargo included basic food supplies for a crew of 75 for a year, 35,000 different varieties of spare parts for the drilling and transportation equipment aboard—in fact everything required for full-scale exploratory campaign. All this was stowed on deck or in the hold. The ship and cargo represented an investment in excess of $2,000,000 at sailing time.

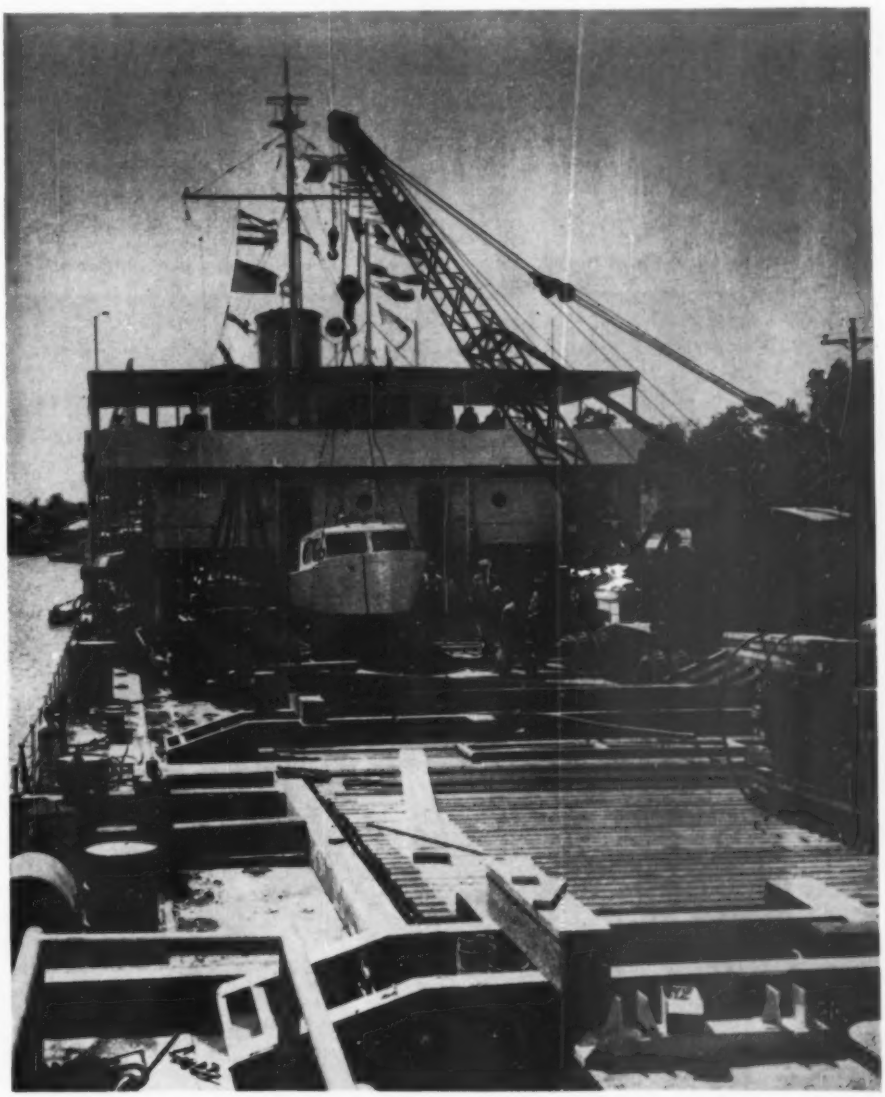
The LST 1014 arrived at Levingston docks in Orange, Texas, on June 15, 1949. After removal of gun tubs, ammunition boxes and other military gear, the unloading ramps were cut away from the vessel and the bow doors were sealed with steel wrapper plates. On June 23 the vessel went on dry dock for inspection and underwater damage repairs. While on the dry dock for general cleaning and painting, a collision bulkhead was installed just aft of the bow doors which had been sealed. Two additional sea chests were installed on the vessel.

The two General Motors diesel main engines and all auxiliary motors and generators were disassembled, completely overhauled and restored to first-class working condition. All pumps and electric controllers aboard the ship were checked and reconditioned as found necessary. The boiler was opened, cleaned, inspected and restored to good operating condition. The old handrails were removed from the vessel and 42-inch handrails forged and galvanized by Levingston were installed on all weather decks of the vessel.

All of the pipe berths and lockers were removed from the crew's quarters on the second deck, and this space was converted to a recreation room equipped with radio receiver, record player and tiled rest rooms. On the main deck the deckhouse was extended to provide for a large mess room. All of the Navy-type galley equipment was removed from the vessel, and new Hotpoint electric equipment was installed. Drainboards, dish racks and such equipment were replaced with

James MacPherson, vice president in charge of operations for American Independent; Ralph K. Davies, president, and N. P. Isenberger, vice president, holding the flag of Kuwait on the deck of the MV Aminoil just before she sailed from Orange, Texas.

The MV Aminoil during loading operations showing how drillpipe, launch and other field equipment were stowed on deck for the long voyage.



stainless steel. Between the galley and the large messroom, staterooms, tiled showers and tiled toilets were installed. The "B" deckhouse was constructed during the conversion work. On this deck there have been provided 21 two-man staterooms, two offices, tiled showers and tiled toilets. Plumbing through the ship was supplied by The Crane Co.

After completion of the superstructure for "B" deck, the navigation deck was constructed. On this deck have been built a pilot house, navigation, chart and gyro compass room, radio room and captain's stateroom. A canvas awning covers the stern portion of the navigation deck not occupied by quarters or lifeboats. All of the decks above the main deck are connected with three outside stairways and one inside stairway, all of which are fabricated with diamond floor plate steps and galvanized handrails.

All quarters are completely air conditioned with Carrier air conditioning equipment. Compressors were built by Gardner-Denver Co. The staterooms are equipped with fluorescent lighting fixtures throughout. This is the first ship to be equipped with this new type lighting fixture. Frozen food refrigeration space has been provided in the forward end of the tank deck for 12,000 cubic feet of frozen food.

During the course of construction the gyro compass was relocated, new RCA two-way radio equipment installed and seven sound-powered telephones provided. The MV Aminoil radio telephone will permit members of the expedition to talk by telephone direct from Kuwait to the American Independent Oil Company's headquarters in San Francisco. Just prior to departure, Ralph K. Davies, president, talked from Orange, Texas, to his office in San Francisco direct from the ship. The Aminoil is the first freighter ever to have this equipment installed. As a matter of fact, only a few of the very largest ocean liners have similar equipment.

All of the floors in the messroom, galley, hospital and ship's service are covered with Terrazzo flooring. Asbestolith flooring has been used in all the staterooms and the recreation room. For fire protection the vessel has been equipped with a complete water and carbon dioxide fire extinguishing system. The ship is also equipped with foam-type fire extinguishers. A new stack, with the company's insignia of the torch of light, was fabricated and installed, with all exhausts relocated up through the new stack.

The conversion work was performed under the general supervision of Tom Seale, chief engineer and Leo LeBron, resident engineer, representatives of Kerr-McGee Oil Industries Inc., acting as agents for American Independent Oil Co. Actual drilling operations in the field will be carried out by Kerr-McGee and the Brown Drilling Co.

The MV Aminoil has an overall length of 327 feet, breadth of 50 feet and load draft of 15 feet on even keel. Fresh water capacity is 500 tons, fuel oil capacity 8,000 barrels and net tonnage 3,390.

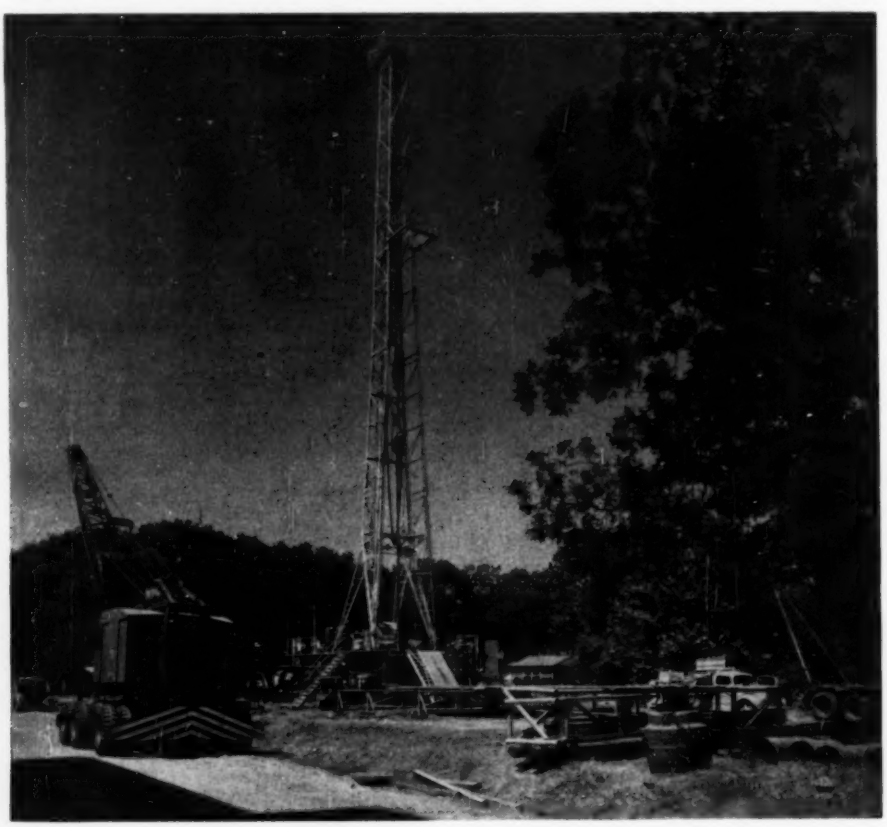
In loading the vessel at Orange, the Link Belt crane was put aboard first and used to load the cargo. At destination this procedure will be reversed. Final item to be loaded was an LCT which is not shown in any of the accompanying photographs. This auxiliary 100-foot transport will be valuable in operating in the shallow coastal waters of the Neutral Zone.

American Independent Oil Co., operator in the new Middle East venture was organized in 1947. President of the company is Ralph K. Davies, former Deputy Administrator of the Petroleum Administration during World War II. Vice presidents are K. S. Adams, president, Phillips Petroleum Co.; S. B. Mosher, president, Signal Oil & Gas Co.; J. Howard Marshall, president, Ashland Oil & Refining Co., and N. P. Isenberger. Other officers include James MacPherson, vice president and general manager in charge of Kuwait operations; Chandler Ide, secretary and treasurer and Raymond W. Ickes, general counsel.

The ten independent oil operators who are stockholders in the American Independent are: J. S. Abercrombie, Houston, Texas; Ashland Oil & Refining Co., Ashland, Ky.; Ralph K. Davies, San Francisco, Calif.; Deep Rock Oil Corp., Chicago, Ill.; Globe Oil & Refining Co., Wichita, Kan.; Lario Oil & Gas Co., Wichita, Kan.; Hancock Oil Co., Long Beach, Calif.; Phillips Petroleum Co., Bartlesville, Okla.; Signal Oil & Gas Co., Los Angeles, Calif., and Sunray Oil Corp., Tulsa, Okla.

Pacific Western Oil Corp., which is concessionaire in the Saudi Arabian part of the Neutral Zone, is headed by J. Paul Getty. The company has operated heretofore on the West Coast in the mid-continent and the Rocky Mountains. It holds substantial interests in Mission Corp. and Tide Water Associated as well as owning the Hotel Pierre in New York City.

Drilling rig to be used in the Neutral Zone was given a test run on shore just before it was loaded on the MV Aminoil.

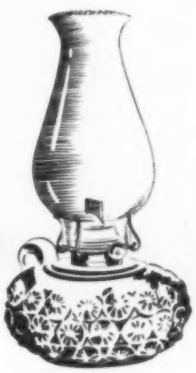


President Ralph K. Davies talking by telephone from a cabin of the ship in the Gulf of Mexico to company headquarters in San Francisco.

90 Years of Progress

Development of the petroleum industry in the past 90 years has paralleled the world's industrial revolution. The modern age has, in fact, been largely implemented by the oil industry's abundant output of oil for power and heat. In the 90-year span the twelve-hour day for workers has shrunk a third and more. The shrinkage in energy output required to get the nation's work done has been far greater. When Colonel Drake drilled at Titusville, 95 percent of the energy produced was by muscle power. Today machines powered by oil, coal and water provide 94 percent of our useful work. Since 1900 oil and gas power has increased 2,700 percent and continues to rise faster than the population. A thumb-nail 90-year history of the industry is suggested in the following page, in which are pictured a few of the milestones in production transportation and refining of oil.

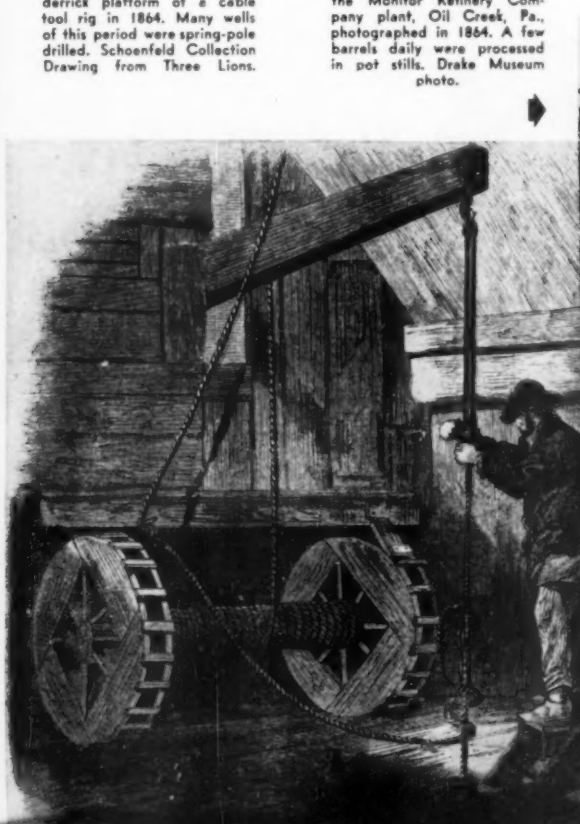
THE KEROSENE ERA



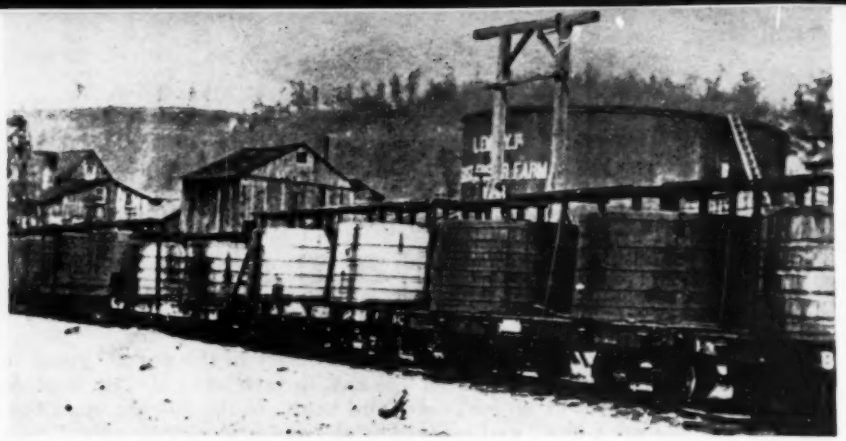
Letting out the screw on the derrick platform of a cable tool rig in 1864. Many wells of this period were spring-pole drilled. Schoenfeld Collection Drawing from Three Lions.

Not a moonshiner's still but the Monitor Refinery Company plant, Oil Creek, Pa., photographed in 1864. A few barrels daily were processed in pot stills. Drake Museum photo.

Colonel E. L. Drake, at right, at the first well drilled for oil which came in August 30, 1859 as a producer at a depth of 69½ feet. Mather collection photo.



Soon after the Drake well Western Pennsylvania hills were covered with derricks similar to those on the Foster farm near Oil Creek as pictured in 1865.

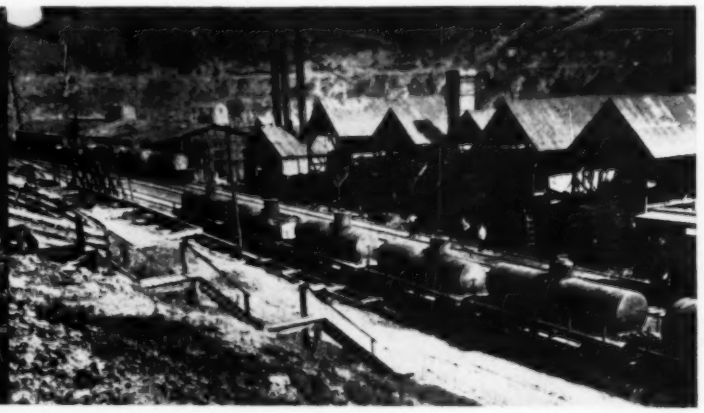


Earliest railroad transportation of oil was in barrels set on flat cars. Capacity of these was so small that tank cars were developed. Pictured above is a train of early tank cars consisting of wooden tanks mounted on flat cars.

Oil development in California came soon after that in Pennsylvania. Shown below is the J. A. Scott refinery at Newhall built in 1876. Standard of California photo.

Early water transportation of oil in western Pennsylvania was by flatboats carrying wooden barrels.

By 1885 vertical wooden tank cars had been replaced by horizontal steel cars with closed domes for loading similar to cars in use today. The pot still was giving way to a shell still as seen in this Drake Museum photograph of the Theobold and Byles refinery at Titusville, Pa.



The Lucas discovery of Spindletop which ran wild for nine days forming a 100-acre lake containing about 800,000 barrels of oil.

90 years

of progress

THE GASOLINE ERA

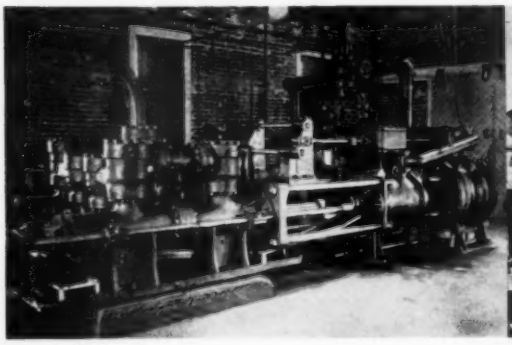
Crowded derricks featured many of the great flush fields through early years of the present century. Shown below is Spindletop where foundations of The Texas Co. and Gulf Oil Corp. were laid. Texaco photo.

Bringing in a gusher in the Spindletop field in 1902. Disastrous field fires were frequent results of such completion practices.

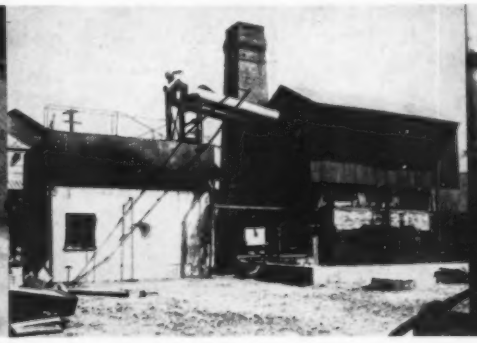
Decked out for the Fourth of July parade at Toledo, Ohio, are kerosine tank wagons of The Standard Oil Co.

The first American automobile show at Madison Square Garden in 1901 featured steam as well as internal combustion motors. Photo courtesy Motor Age.

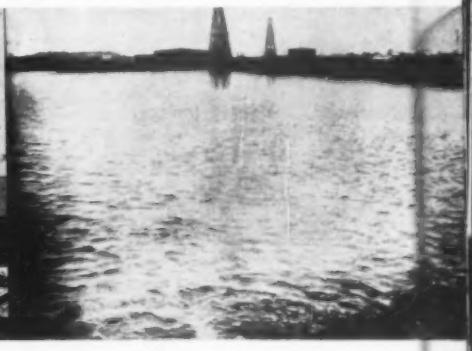
Interior of U. S. Pipe Line pump station at Titusville, Pa., in 1903. First line was a 2-inch wrought iron pipe laid from wells to a Titusville refinery in 1863.



The first Burton semi-commercial still at the Whiting, Indiana, refinery of Standard Oil Co., Ind., father of the modern cracking process.



In 1914 the Cushing field was flooding the market wi oil. This photo by Clarence Jack of Tulsa, shows earthen storage tank containing 500,000 barrels of crud

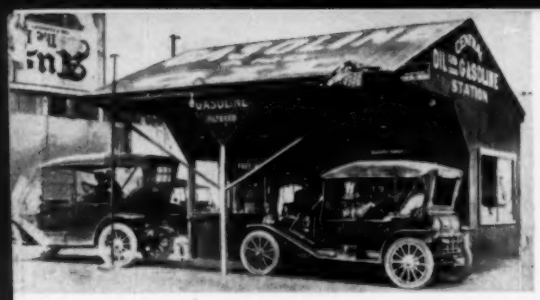


California also was having its own gushers in the first decade of the new century. Shown is the Lakeview No. 1 in the Midway field at Maricopa which came in on March 15, 1910 with a production of 68,000 barrels daily. Union Oil Co. photo.

Efforts to conserve light fractions were undertaken by the installation of compression plants as early as 1910.

Bartlesville was the scene of one of the early Oklahoma oil booms. Pictured here is the townsite field in 1903. Some of these wells still are pumping.

Many of the refineries in the first quarter of the century used coal to fire the long batteries of shell stills. Pictured is the Sun Oil Co. plant at Marcus Hook, Pa.



Canopies to protect motorists from sun or rain during servicing operations began to appear very early as is seen in this 1910 gasoline station. Standard of Indiana photo.

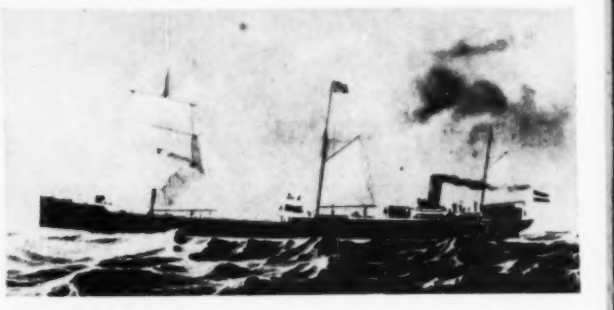
This 1913 Standard Oil Co. of Ohio station at Park and Russell streets in Columbus was of the true drive-in type.

No picture of an oil well about 1916 was considered proper unless oil was flowing over the crown. Clarence Jack, Tulsa, photo near Glen Pool.

A mired truck on the main road to the Seminole field in Oklahoma in 1927 was not an uncommon sight. Standard Oil Co. (N. J.) photo.

The Glückauf, a 300-foot, 3020 DWT sailing ship with auxiliary steam built in England in 1886 was the first oil tanker in the modern sense with oil transported in bulk.

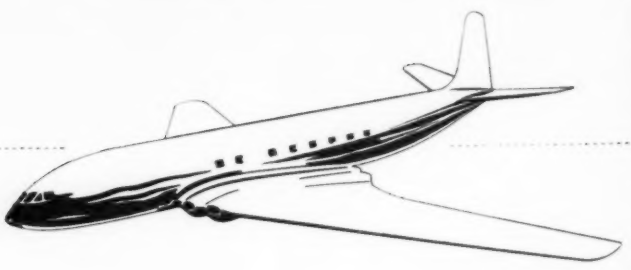
Development of Oklahoma fields about the time of World War I resulted in the erection of a large number of small refineries such as this one of Okmulgee Refining and Producing Co. Clarence Jack photo.



Supply row in the typical Oklahoma oil boom town twenty-odd years ago was always a busy place and hub deep in either mud or dust. Standard Oil Co. (N. J.) photo.

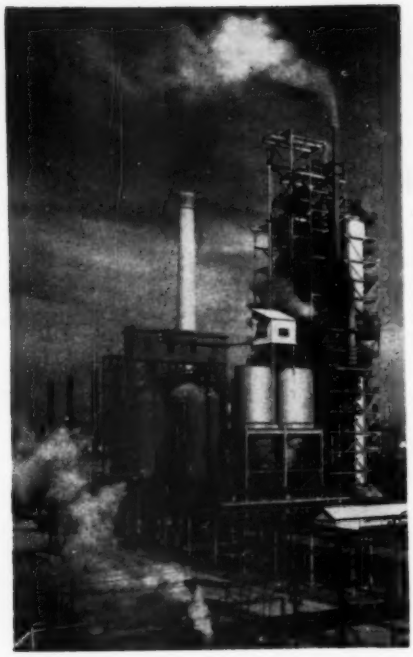
90 years of progress

THE MODERN ERA



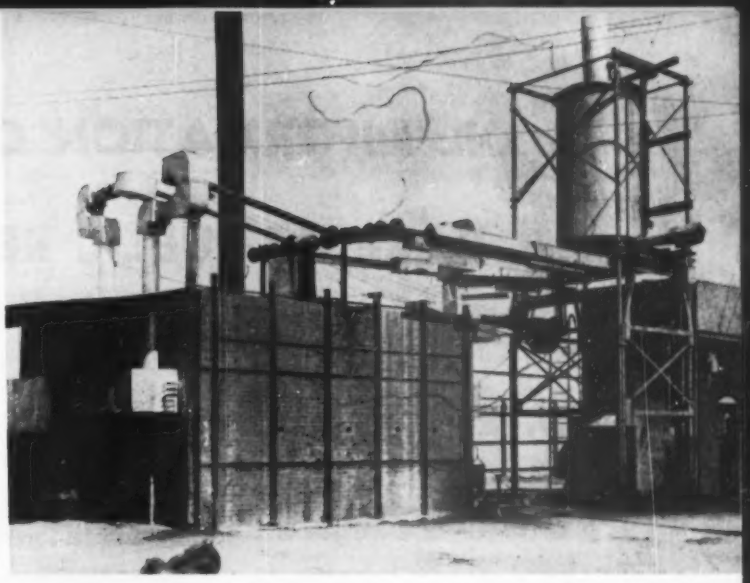
The spring-pole of 90 years ago drilling to a depth of 70 feet has been supplanted by million-dollar offshore rigs capable of drilling to 20,000 feet. Humble Oil & Refining Co. photo.

A milestone in the history of oil transportation was the wartime construction of the "Big Inch" pipeline and its companion "Little Inch" from Texas to the Atlantic seaboard.

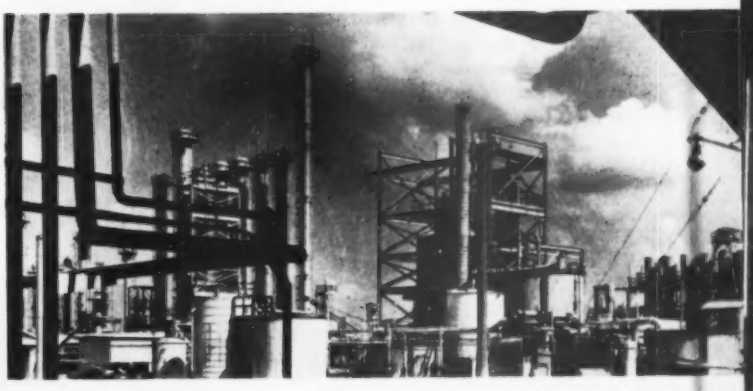


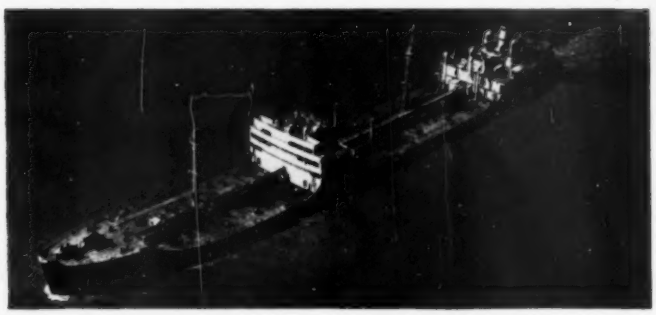
The first fluid catalytic cracking plant installed during World War II at the Baton Rouge, La., refinery of Standard Oil Co. (N. J.).

In June, 1919, the Dubbs cracking unit pictured here was demonstrated to members of the Western Petroleum Refinery Association at Independence, Kansas. Subsequently the process was installed by a large number of independent refiners as well as larger companies.

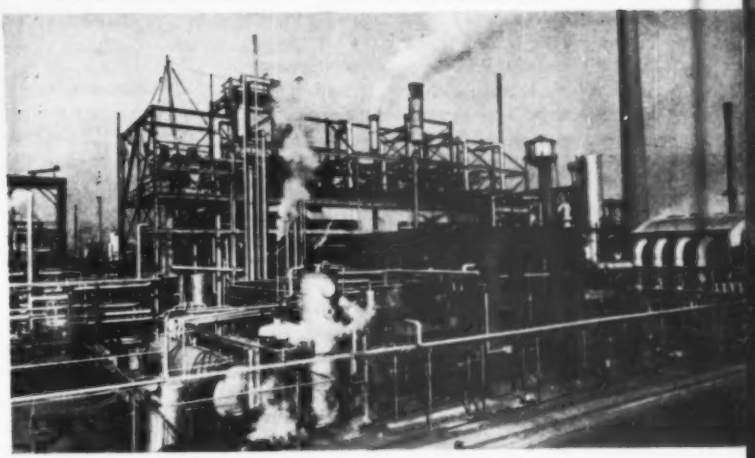


Production of alcohols, ketones and other chemicals is becoming an important adjunct to many modern refineries. Pictured is the Houston isopropyl alcohol plant of Shell Chemical Co.



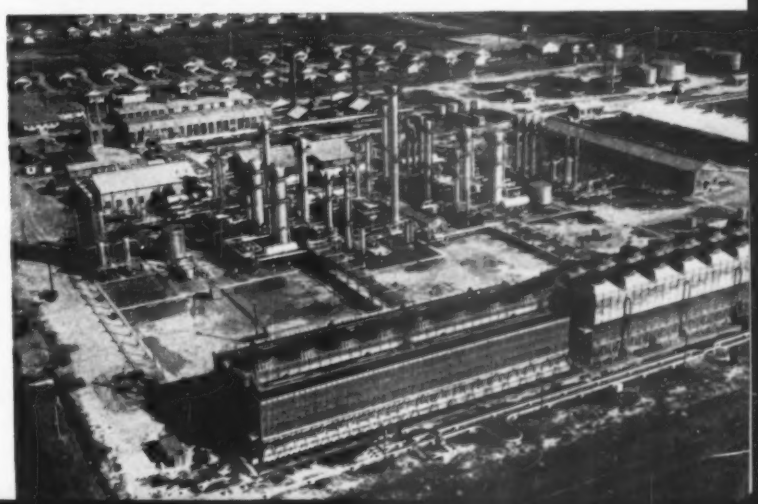


United States shipyards made the building of modern high-speed tankers a mass-production job during World War II with the result that the Armed Forces always were supplied with oil.



One of the important milestones in the modern refining era was the development of catalytic cracking processes. First such plant was the Houdry unit built in 1937 by Sun Oil Co. at Marcus Hook, Pa.

Greater drilling depths attained by modern rigs have required more massive machinery and hence demanded automatic, power operated tongs, slips and other pipe handling equipment. Shown is the equipment on the floor of Humble's Rig. 30.



Conservation developments in the oil industry in recent years have lead to the construction of immense gasoline recovery and cycling plants such as the Katy cycling plant built by a group of operators in the Katy field near Houston, Texas.

OIL INFORMATION COMMITTEE INCREASES PACE OF PUBLIC RELATIONS PROGRAM

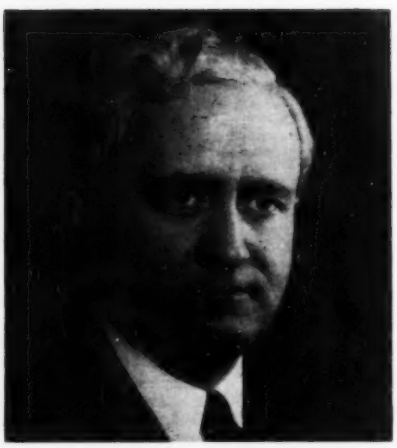
NOW in its 90th year, the fast-moving petroleum industry stepped up the pace of its information program in 1949 to put special emphasis on its long and unbroken record of progress and community service, and to whip home the over-all theme that the indivisible relationship existing between progress and petroleum will become ever stronger in the future, and of greater benefit to all mankind.

The information program, now rounding out its third year, continued to grow in acceptance and support during the last 12 months, resulting in closer contact with community life throughout the nation. The highlight of the year was Oil Progress Week, which ran from October 16 through October 22. This week of parades, open houses, exhibits, speeches, luncheons, radio and television programs and motion picture showings was a spectacular amplification of 1948's one-day celebration. Its success was assured in advance by the hard work of more than 5,000 oil companies, 6,000 Oil Industry Information Committee members, 100 trade associations and a staff of field representatives. They constructed their operations around the three 1949 slogans: "Ninety Years of Progress;" "A Good Citizen—A Good Industry," and "Building For the Future."

A souvenir booklet entitled "Pocketbook of Progress" and a leaflet called "Petroleum, Power for Progress" were the basic pieces of literature which told the Oil Progress Week story to the public. The first explained why the 90 years of petroleum's history coincide with the 90 years of America's greatest progress, and the leaflet echoed this theme.

Both of these pieces were part of an extensive Community Action Package containing sample radio scripts, pattern speeches, tie-in advertisements, publicity and printed materials. The package was preceded by two printed guides "Holding Open House" and "Organizing and Conducting Oil Men-Community Leaders Meetings." Together they gave District, State, Area and Community members of the O.I.I.C. step-by-step suggestions for arranging and conducting Oil Progress Week Events.

Preliminary reports to O.I.I.C. headquarters from the field indicated that last year's Oil Progress Day was eclipsed in advance by a wide margin. This applies to the number of persons reached with the industry message, the effectiveness of that message and the amount of active participation provided by companies, trade associations and individual oil men. Using the experience gained in 1948, these representatives of the industry employed initiative and imagination in putting on their shows in 567 communities and in making thousands of new friends for oil. Here are just a few examples of what was accomplished:



Conger Reynolds, director of public relations for Standard Oil Co. (Indiana) has served as chairman of the Oil Information Committee during the past year.

The governors of New Jersey, Illinois, Kentucky, Wisconsin, Texas, Arkansas and Colorado were among those issuing proclamations regarding Oil Progress Week. Governor Driscoll of New Jersey expressed the hope that the oil industry "will continue to expand in our State with its unsurpassed geographical advantages, abundance of skilled labor, and a firm resolve to promote the private enterprise system." Governor Clements directed the attention of Kentucky's citizens "to the contribution and service the oil men of our State make to its social and economic development." Governor McMath of Arkansas spoke in Eldorado's courthouse square on Oil Appreciation Day, Oct. 18, and Governor Turner of Oklahoma addressed an open meeting of the Chamber of Commerce Oil Forum in Tulsa, Oct. 20. In addition, mayors of scores of communities issued their own proclamations.

Oil men in nearly a hundred communities—more than twenty-five of them in New York and New Jersey—organized "community leader" luncheons and dinners where the progress story was told.

Approximately three and a half million copies of the souvenir leaflet and a million and a half copies of the booklet were distributed. Complete statistics on the amount of tie-in advertising and the extent of trade association participation have not yet been tabulated but were substantially greater than last year.

Oil men all over the country arranged hundreds of showings of the new industry motion picture, "The Last Ten Feet" before meetings of employees and public gatherings such as service club luncheons and school assemblies. In addition, there were television presentations of the picture as well as large numbers of radio broadcasts, speeches and special newspaper sections and editions.

Continuous showings of "The Last Ten Feet" were made from a shadow box on the back of a sound truck in Atlanta, Ga. This truck circulated throughout the city during the seven day observance. Palmyra, Mo., was another of the cities which showed the film continuously.

New Orleans residents witnessed a huge parade down Canal Street. Equipment in the line of march emphasized the theme "The Never-Ending Search for Oil" and included such unusual pieces as "shot-hole" drilling rigs and "marsh buggies." Galesburg, Ill., had a parade telling the story of progress in transportation. It was headed by a man on foot, followed by one on horseback and others in wagons, carriages and early and late model autos. Other parades were held at Canton, St. Louis, Columbia and Jefferson City Mo., and at Fargo, N. D.

Yale University, the New Haven Railroad and the New Haven Chamber of Commerce cooperated with oil men to tell the story of petroleum's progress to citizens of the Connecticut community where the first company to successfully drill for oil was formed. In nearby Stamford, Conn., the same story was told at a joint meeting of all service clubs.

At Grand Forks, N. D., there was an Oil Progress Week picnic for 1,500 school children. In addition to the parade at Fargo there was a "progress exhibit" in the town square with a new Diesel locomotive on display.

An eastern company dedicated its new catalytic cracking plant on October 17 and followed up with a week-long Open House for employees and the public. An "Employee Day" at a Billings, Mont., refinery preceded an Open House. Open Houses also were held at three Casper, Wyo., refineries and a pipeline pumping station.

More than 4,000 service station dealers and their wives from the Chicago metropolitan area observed Oil Progress Week at a rally in the Chicago Civic Opera House. Samuel B. Pettengill, former U. S. Representative from Indiana was the principal speaker. "The Last Ten Feet" was shown.

An Illinois company staged an airplane press tour of its plants and an Ohio company posted 2,200 Oil Progress Week A-boards at service stations as well as a large number of 24-sheet billboard advertisements.

There was an on-the-spot radio interview with the captain of a tanker at Portland, Me., and round-table radio discussions about oil in Detroit, Newark and other cities.

A float in the University of Dayton's Centennial Parade carried a replica of Ohio's first oil well. A portable derrick and drilling rig was erected in the courthouse square at Mt. Vernon, Ill. Great Bend, Kansas, had a three day "Oil Appreciation Festival." And a market showing where the first helium well in the world was brought in was dedicated at Dexter, Kansas. Model derricks and transportation equipment were displayed in Milwaukee's hotel lobbies and department store windows.

In Savannah, Ga., a replica of the Drake Well was erected on the grounds of the Oglethorpe Hotel on the occasion of a huge dinner for civic leaders and oil men who came dressed in the costumes of 1859. A Savannah baker supplied "90th Birthday Cakes" to service stations and oil company installations in the city.

The Oil Heat Association of Maryland gave a luncheon in Baltimore. Guests were transported in decorated oil company equipment furnished by various companies in the district.

The Metropolitan New York O.I.I.C. and the Oil Trades Association arranged a gala luncheon at the Waldorf-Astoria Hotel. Speakers were Mayor William O'Dwyer and oil men Frank Abrams and John Harper.

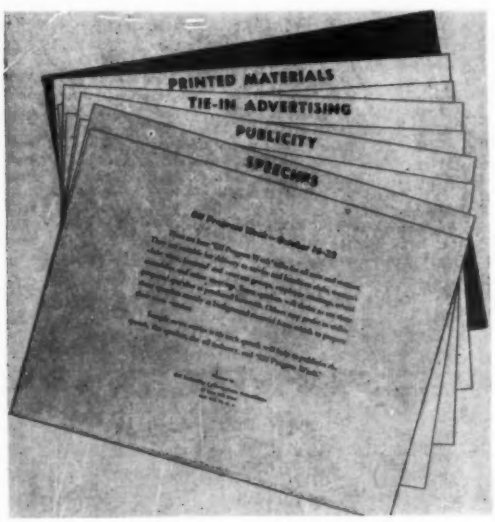
The Omaha, Neb., committee staged a "Miss Oil Progress Week" contest. The week was observed jointly with the annual Ak-Sar-Ben which commemorates Nebraska's entry into the Union.

There were special "Oil Progress Week" editions of the Corpus Christi, Tex., "Caller and Times", the Houston "Post", the Houston "Press" and the Shreveport, La., "Journal." Special sections were printed in the New Orleans "Times-Picayune", the New Orleans "Item" and in the papers of numerous other cities. A special edition of the Eldorado, Ark., "News" tied-in with two Open Houses, speeches before seven civic clubs and film showings at the high school.

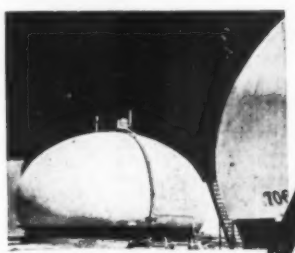
The total number of speeches throughout the country can be roughly estimated from the fact that 123 of them were made before civic and service clubs in the Rocky Mountain District alone.

The resounding success of "Oil Progress Week"

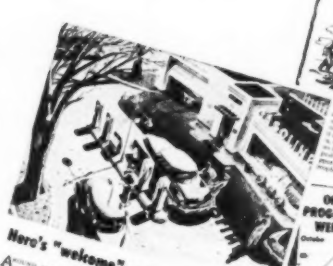
(Please Turn to Page 94)



Preparation for Oil Progress Week included the development of an elaborate parcel containing five folders with ready-made speeches, radio scripts, advertising and publicity.



Pumpkins to coaches



OIL PROGRESS WEEK
Here are suggested CLOTH TRUCK B.
This is Oil Progress
OIL BUILDS FOR AMERICA'S FUTU
Petroleum Promotion Program
Here are suggestions for TRUCK BUMPERS
YOUR NAME HERE
OIL BUILDS FOR AMERICA'S
Oil Progress Week October 16th-22nd

Advertising mats have been supplied to oil companies throughout the year to supplement the national advertising sponsored by the Oil Information Committee.

DAKOTA AND MUDDY STRIKES

STEP UP DENVER BASIN PLAY

By Joseph A. Kornfeld

Reservoir Engineer, Sohio Petroleum Co.
Oklahoma City, Oklahoma

OIL discoveries in the Dakota and Muddy sandstone reservoirs of Upper Cretaceous age in southwestern Nebraska and southeastern Wyoming in recent weeks have precipitated a major geophysical, land and exploration play extending over the Denver basin. The three-state area extends from the Front Range across eastern Colorado to the Kansas state line and across western Nebraska almost to the South Dakota boundary.

Gurley field discovery in Cheyenne county, Nebraska, by the Ohio Oil Company marks the first commercial oil production to be found in the Cornhusker state west of the Nemaha granite ridge. It is also the locale of the first oil field to produce from the Cretaceous system in Nebraska. The only other development in that state lies east of the Nemaha granite ridge in the Forest City basin where four fields are producing from the Hunton limestone of Siluro-Devonian age. However, Gurley is not spectacular from either a productivity or structural standpoint, yet it is significant in that a major exploratory program followed the completion of two commercial oil wells completed at a depth of only 4,400 feet. Other economic factors precipitating the development are the high gravity of the oil and the excellent refining qualities of the crude as well as the proximity of a major oil pipeline. This play is spreading along a northeast-southwest trend into northeastern Colorado. Regionally, Gurley lies in the northeast limb of the Denver basin.

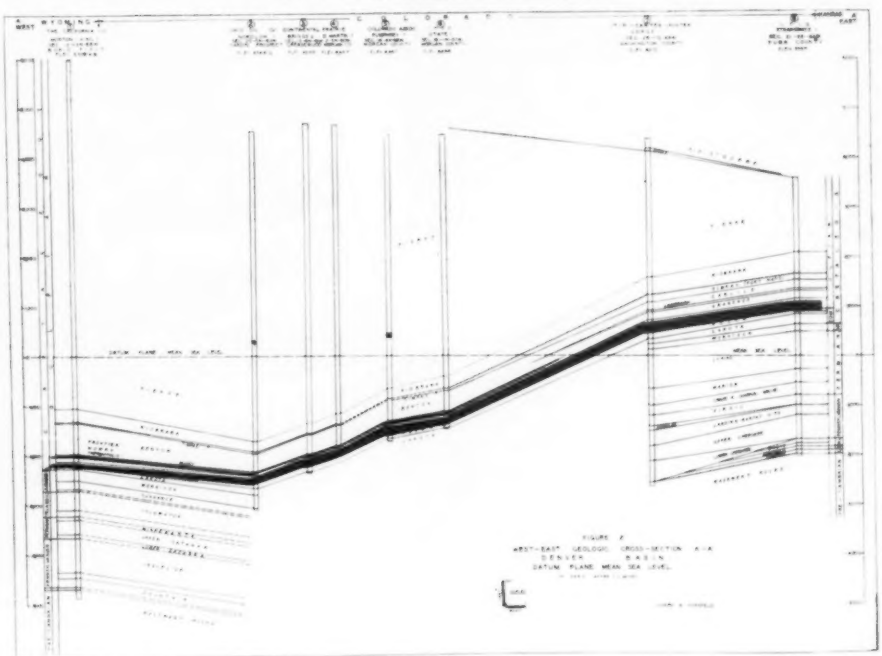
Fig. 1: Regional Subsurface Structure, Top of the Dakota Sandstone.

Borie field discovery in Laramie county in the southeastern corner of Wyoming by The California Co. opens the second important Muddy sand field for the north limb of the Denver basin. Situated 22 miles south and slightly east of the Horse Creek (Muddy sandstone) field of Laramie county, the Borie strike is productive from a plug-back depth of 8,701 feet after deeper objectives sought down to 11,000 feet proved nonproductive.

Geographic position of these two strikes is indicated by arrows in Fig. 1, "Regional subsurface structure, Denver basin, top of the Dakota sandstone." The geologic position of the Muddy sandstone objective is traced by the red color overlay in Fig. 2, "West-east geologic cross-section, Denver basin."

The discovery well in the new Gurley field in Cheyenne County, Nebraska, was the Ohio Oil Company's M. E. Egging 1, located in the NEc

Fig. 2: West-east geologic cross-section A-A', Denver Basin. Color overlay shows lateral extent of the Muddy and Dakota sand objectives. Wells shown in cross-section are as follows from west to east: (1) The California Co.'s Morton-King 1, C EL NW/4 SW/4 Sec. 13-13n-68w, Elev. 6,509' k.b., T. D. 11,374½' (drillers) 11,330', (Schlumberger), PB. 8,570', SDT @ 8,074' N. T. D. 8,701', discovery well of Borie (Muddy) Field, Laramie County, Wyo.; (2) The Ohio Oil Co.'s Nordloh 1, C SE/4 SE/4 Sec. 20-5n-63w, Elev. 4,544' g., T. D. 7,625' Hardin prospect, Weld County, Colo.; (3) Continental Oil Co.'s Briggs 2, C NE/4 SW/4 Sec. 13-6n-61w, Elev. 4,669', T. D. 7,024', Greaseweed Field Weld County, Colo.; (4) Prairie Oil &Gas Co.'s Dorothy Martin 1, C NE/4 NW/4 Sec. 2-5n-60w, Elev. 4,657', T. D. 6,588', wildcat, Morgan County, Colo.; (5) Colorado Associated Oil Co.'s Pumphrey 1, C SE/4 SE/4 Sec. 14-4n-58w, Elev. 4,467' T. D. 6,176', wildcat, Morgan County, Colo.; (6) I. T. I. O. State 1, C NE/4 NE/4 Sec. 16-1n-57w, Elev. 4,468', T. D. 5,920', wildcat, Morgan County, Colo.; (7) I. T. I. O.—Carter—Foster's Vorce 1 C NE/4 NE/4 Sec. 28-1s-49w, Elev. 4,372', T. D. 7,020', wildcat, Washington County, Colo.; (9) I. T. I. O. Strangways 1, C NW/4 SW/4 Sec. 21-2s-43w, Elev. 3,592', T. D. 5,610', wildcat, Yuma County, Colo.



NE/4 NE/4 of Section 11-15n-49w. It was spudded in on April 27, 1949. Kerr-McGee, Inc., Oklahoma City, were the drilling contractors.

The design of the casing program indicated that objectives below 4,500 feet were anticipated. The conductor was 18⅝-inch pipe set at 80 feet and cemented with 60 sacks. The surface string was 13⅜-inch set at 1,155 feet and cemented with 735 sacks. When the Dakota sand was encountered at 4,401 feet (196 feet below sea level) and penetrated 28 feet, 9⅝-inch pipe was set for completion.

No attempt to test deeper objectives was made in the discovery well, and the Egging well was completed in the first Dakota on July 16, 1949, for an initial gauge of 230 barrels of 35 gravity oil per day on the pump.

Although the discovery well was drilled on a 10-acre location, Ohio Oil Co. engineers decided on a 40-acre spacing pattern for development of the Dakota reservoir. Accordingly the first offset was staked 1,320 feet due north of Egging 1 at their W. T. Knievel 1, in the NEc SE/4 SE/4 of Section 2-15n-49w. Company tools were used on this test.

Casing design was radically modified for the Dakota objective in the first offsets, and the intermediate string was eliminated.

Size	Setting Depth-Feet	No. sacks of cement
10¾-inch	1,033	346
7-inch	4,386	150

First Dakota sand objective was topped at 4,396 feet and was found saturated to 4,437 feet. A 19-foot shale break separated the first and second Dakota zones. The second sand was logged from 4,456 to 4,482 feet and recovered saturated sand in cores, but on drill-stem test 2,300 feet of salt water were recovered. A drill-stem test of a possible third pay zone logged from 4,548 to 4,584 feet recovered 860 feet of salt water. In all, 41 feet of saturated Dakota sand were logged. Knievel 1 was drilled to a total depth of 5,026 feet, plugged back to 4,429 feet and 7-inch casing set at 4,386 feet for completion.

Table 1

Formation Marker Summary
Gurley Field Discovery Well
Cheyenne County, Nebraska
The Ohio Oil Co., M. E. Egging 1 NEc NE/4 NE/4 Sec. 11-15n-49w
Elevation: 4,205 feet d. f.

Formation	Schlumberger Determinations (Feet)	
Niobrara	3,634	(+571)
Timpas (Ft. Hays)	3,870	(+335)
Codell	3,972	(+233)
Benton	3,983	(+222)
Greenhorn	4,155	(+ 50)
First Dakota	4,401	(—196)
Total Depth	4,429	(—224)

Ohio Oil Co. continues development of the field on a 40-acre spacing plan. The east offset to the discovery is Stueve 1, located in the NEc NW/4 NW/4 of Section 12-15n-49w, 1,320 feet between locations. Ohio has filed application with the Nebraska Public Service Commission for permission to construct a 20-mile lateral from the field to a junction with the 16-inch trunkline of Stanolind Pipe Line Company extending from Wyoming to Kansas City, Missouri.

Meanwhile, two semi-wildcat dry holes defined limits of the new area. Two miles southeast of the discovery well Robert Brothers' Thompson 1, located in the NWc NW/4 SE/4 of Section 18-15n-48w, found the Dakota sand objectives 64 feet low. Dakota sand was topped at 4,431 feet (260 feet below sea level) and was drilled to 4,462 feet total depth. A 30-minute drill-stem test from 4,431 to 4,462 feet recovered 3,100 feet of salt water and the well was plugged and abandoned. Four miles northwest of the Ohio wells Frontier Refining Co. and Ideal Refining Co. found the Dakota sands barren and low at their Baker 1, located in the NEc NE/4 SE/4 of Section 20-16n-49w.

Third oiler for the Gurley field is Ohio Oil Company's Stueve 1, located in the NEc NW/4 NW/4 of Section 12-15n-49w, one-fourth mile east of the discovery well. First Dakota sand was topped at 4,410 feet and penetrated to 4,425 feet total depth. The 5½-inch oil casing was set and cemented at 4,412 feet. When cement plug was drilled out, the well swabbed 27 barrels of oil per hour, never more than 2,200 feet off bottom. Rig has been moved to Stevens 1, in the NEc SE/4 SW/4 of Section 2, five-eighths of a mile north and west of the pool-opener.

The discovery well in the new Borie field in Wyoming was the California Company's Morton-King No. 1, located in the C EL NW/4 SW/4 of Section 13-13N-68W. Originally projected as a Pennsylvania project, Morton-King No. 1 was spudded in on Nov. 2, 1948. Loffland Brothers of Tulsa were the drilling contractors.

The surface string was 20-inch pipe set at 110 feet and cemented with 200 sacks. The protection casing was 13⅜-inch pipe set at 1,819 feet. The well was drilled to a total depth of 11,374½ feet (4,866½ feet below sea level) in pre-Cambrian granite topped at 11,205 feet (4697 feet below sea level). Three drill stem tests conducted opposite the Ingleside failed to develop commercial production. The hole was then plugged back to 8,954 feet for a completion attempt in the Muddy sand series topped at 8,540 feet (2,032 feet below sea level). An open hole drill-stem test was made at this depth with packer set at 8,507 feet. Swab was run and after 19 runs in 6¾ hours, a total of 85.5 barrels of 28°API gravity oil was recovered, cut with two percent basic sediment. Drill pipe was pulled and

Fig. 3: Colorado-Wyoming Front Range Sections. Color overlay shows the stratigraphic relationships of the Ingleside tongue of the Casper formation of Pennsylvania age which may offer a new Denver basin oil objection basinward. (After Thompson and Kirby)

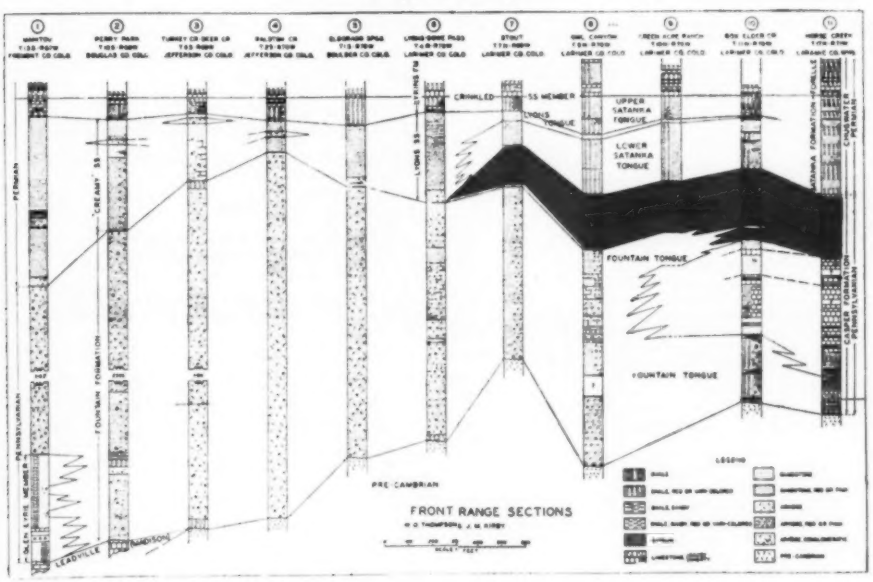
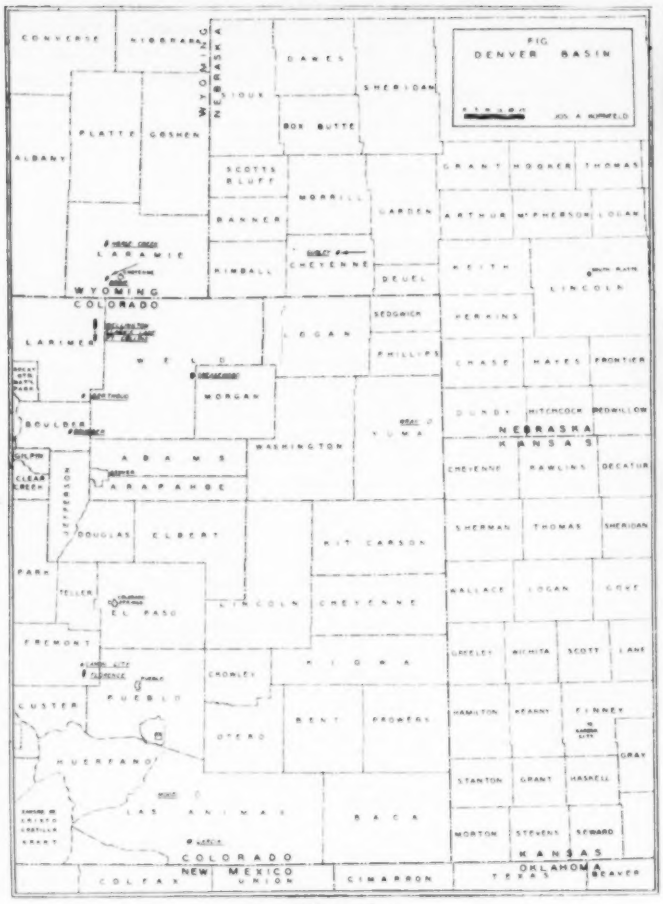


Table 2

Formation Marker Summary
Borie Field Discovery Well
Laramie County, Wyoming
T. D. 11,374½ (Drillers)
The California Co., Morton-King 1, C EL NW/4 SW/4 Sec. 13-13n-68w.
Elevation: 6,508 feet d. f.

Formation	Schlumberger Determinations (Feet)		Sample Determinations (Feet)	
Niobrara	7,550	(—1,042)		
Timpas	7,823	(—1,315)		
Codell	7,844	(—1,336)		
Muddy	8,483	(—1,975)		
Dakota	8,630	(—2,122)	8,630	(—2,122)
Fuson	8,699	(—2,191)		
Lakota	8,731	(—2,223)	8,761	(—2,253)
Morrison	8,769	(—2,261)	8,769	(—2,261)
Sundance	9,004	(—2,496)	9,004	(—2,496)
Jelm	9,168	(—2,660)	9,174	(—2,666)
Chugwater	9,218	(—2,710)	9,365	(—2,857)
Minnekahta			9,730	(—3,222)
Upper Satanka			9,805	(—3,297)
Lower Satanka			10,070	(—3,562)
Top Ingleside	10,165	(—3,657)	10,160	(—3,652)
Base Ingleside	10,850	(—4,342)		
Fountain	10,970	(—4,462)		
Kalonized Granite	11,150	(—4,642)		
Granite	11,205	(—4,697)		
Total Depth	11,330	(—4,822)		



Map of Denver Basin.

Fig. 4: Regional attitude of the top of the basement complex, Denver basin.

the seven-inch oil string set at 8,760 feet and cemented with 530 sacks. Gun perforator was run, and swabbing tests made as follows opposite the Muddy sand:

Depth - Feet	Perforation Density (Shots/Foot)	Swabbing tests through casing perforations
8,540-8,565	6	Rec. 6 BOPH, 36.9° API, Avg. 3 BOPH
8,582-8,586	6	Squeezed off perforations

However, in the completion attempt a fishing job developed at 8,074 feet. Failing to recover the fish, crews ran a milling tool, cut a window at that depth and set a whipstock. Drilling was resumed in a sidetracked hole to a depth of 8,701 feet. The Muddy sandstone was topped at 8,484 feet. Drill-stem tests were run as follows:

Packer Seat Depth - Feet	Total Depth Feet	Tool Open For	Recovery
8,484	8,519	10 mins.	Recovered estimated 300-ft. oil and gas-cut mud
8,483	8,519	55 mins.	Gas rose to surface in 25 min. Recovered 2,200 ft. 34°API oil; 120 ft. mud
8,634	8,701		No recovery

A five-inch liner was set from 7,966 to 8,488 feet prior to recompletion in the Muddy sandstone. The two-inch tubing was swung at 8,506 feet with packer seated at 7,916 feet. The hole was then unloaded, and after the flow was turned into tanks, the initial gauge was 173 barrels of 38.4° API gravity oil, corrected, produced through a ¼-inch choke. Analyses show the crude to have a paraffin base.

No developmental plans for the field have been announced at the time of this writing. The dis-

Table 3

Typical Formation Marker Summary
Horse Creek Oil Field
Laramie County, Wyoming
General Petroleum Corp., No. 72-6-P 330' N. of S. L. 330' E. of W. L. Lot 1, Section 6-16n-68w.
Elevation: 6,761 feet k. b.

Formation	Schlumberger Determinations (Feet)	
Niobrara	4,280	(+2,481)
Timpas	4,560	(+2,201)
Codell	4,568	(+2,193)
Benton	4,590	(+2,171)
Muddy	5,271	(+1,490)
Total Depth	5,298	(+1,463)

Casing Record:

9-5/8 inch	256 feet	125 sacks
5-½ inch	5,273 feet	250 sacks

Drilling Commenced: July 1, 1949
Drilling Completed: August 7, 1949

#Estimated

Table 4

Oil Production Statistics
Horse Creek Oil Field
Albany County, Wyoming
Muddy Sand Reservoir 5,400 feet
Lakota Sand Reservoir 5,500 feet
Discovery Date: October, 1942
Principal Operator: General Petroleum Corp.

Year	No. Oil Wells	Crude Oil Production Annual	Cumulative
1942	1		
1943	2	11,545	11,545
1944	2	5,043	23,197
1945	2	9,426	32,623
1946	3	15,214	47,837
1947	7	67,489	115,326
1948	16	248,222	363,548
1949	25	766,000#	1,129,548#

Table 6

Geophysical and Core-Drilling Activity
Rocky Mountain Province
(Status as of July 31, 1949)

Data: "Compact Comments," Interstate Oil Compact Commission, Vol. 4, No. 9, (September 1, 1949), page 14.

State	Seismic	Gravity	Magnetometer	Total Geophysical	Core Drill	Total Crews
Colorado	2	1	0	3	0	3
Montana	16	6	0	22	0	22
Nebraska	3	0	0	3	0	3
N. Dakota	7	2	2	11	0	11
Utah	4	1	1	6	0	6
Wyoming	4	1	1	6	0	6
Totals	36	11	4	51	0	51

covery offsets a wildcat well drilled during 1938 by Amerada Petroleum Corp. which logged non-commercial oil showings in the Muddy sandstone.

Potential reservoir for the West limb of the Denver basin is the Ingleside tongue of the Casper formation of Pennsylvania age. Stratigraphic relationships of this formation are well illustrated in Figure 3, "Colorado Front Range Sections," which carries a color overlay showing the Ingleside tongue, at several outcrops in Laramer county, Col., and Laramie county, Wyo. Basinward, as much as 850 feet of Ingleside is represented in the Borie (Muddy) sand discovery well of The California Company's Morton-King No. 1, C EL NW/4 SW/4 of Section 13-13n-68w, Laramie county, Wyoming. Morton-King No. 1 topped the Ingleside at a depth of 10,165 feet (3,656 feet below sea level) and based the Ingleside at 10,850 feet (4,341 feet below sea level). The bottom portion of this formation carried oil saturation in fractured, low-permeability dolomite as shown from core data as follows:

Core	Range - Feet	Recovery Feet	Remarks
(26)	10,516-10,543	25	Dolomite, porous, fractured with some oil saturation
(27)	10,543-10,570	12	Dolomite, porous, low permeability, fractured, some oil saturation
(28)	10,653-10,680	27	Fracture in bottom 9-ft. Vertical, flushed with drilling mud
(29)	10,729-10,755	26	Vuggy in bottom 7-ft. Low permeability, oil saturation, fractured

However, a series of four drill-stem tests conducted opposite various zones in the Ingleside recovered no oil.

The first Muddy sand oil pool for the north limb of the Denver basin was the Horse Creek field recorded in October, 1942, by the General Petroleum Corp., 21 miles northwest of Cheyenne in Laramie county, Wyo. Horse Creek marked the first geophysical strike for the Rocky Mountain province and the first oil discovery drilled on a gravity anomaly in that region. During the summer and fall of 1940, Independent Exploration Co. of Houston conducted a gravity-meter survey over the Tertiary-covered beds lying between Wheatland and Cheyenne. Several anomalies were found which were leased and turned over to General Petroleum Corp. However, the reflection seismograph was used to check the gravity anomaly prior to testing with the drill.

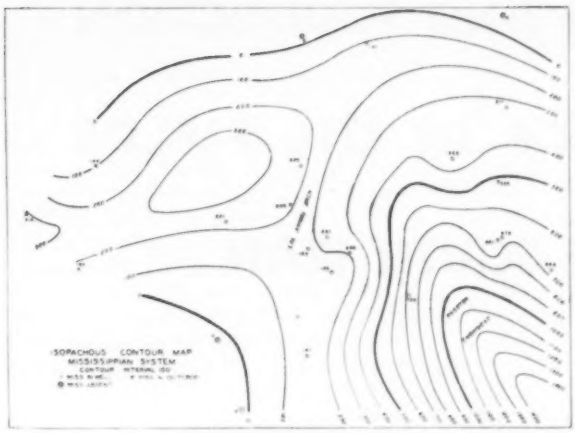


Fig. 5: Isopachous Contour map—The Mississippian System—Denver basin.

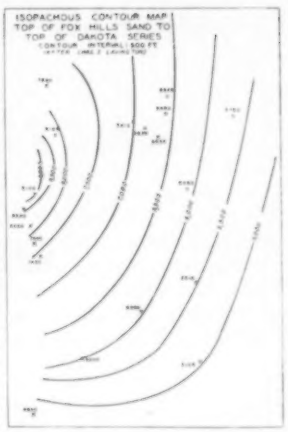


Fig. 6: Isopachous Contour Map—Top of Fox Hills to Top of Dakota series.

The discovery well was General Petroleum's Government No. 78-31, located in the SWc SE/4 SE/4 of Section 31-17n-68w. Lakota sand topped at 5,451 feet carried saturation and completion was made in this horizon. Original total depth was 5,531 feet in Morrison (Jurassic) sediments topped at 5,514 feet. Initial production was 580 barrels of 30.4° API crude, one of the best completions in the field. Later drilling indicated this well was located on the west side of the structure and development proved an area three miles northeast to southwest and from two to five locations in width.

Muddy sandstone is the principal oil reservoir and is found at an average depth of 5,400 feet. Development lagged for the first four years following the discovery, and it was not until 1948 when substantial drilling was undertaken. Currently 25 oil wells are producing from the Muddy. Although initial productivity per well ranges up to 225 barrels per day, per well recoveries have been disappointing for this depth. (See Tables 4 and 5.)

Unitization agreement for the Muddy sand reservoir was entered into between the United States Geological Survey and General Petroleum Corp., the sole operator. The Muddy sand unit covers about 2,560 acres. Spacing pattern followed in development of the Muddy sand reservoir is 40 acres per well. Usually locations are staked in

(Please Turn to Page 96)

Data: "Statistics of Oil and Gas Development", A.I.M.E.

Table No. 5

Summary of Production Statistics — Cretaceous Reservoirs
The Denver Basin

A. Oil Reservoirs

State	County	Field	Reservoir	Date of Discovery	Method of Discovery	Proved Developed Acreage	Init. B.H.P. psig	Avg. Pay Depth (Ft.)	Type Str.	STO Gravity °API	Well Spacing Acres	No. Producing Oil Wells, August, 1949	Daily Average Production Bbls., August, 1949	Annual Production (During 1947)	Cumulative Production (To 1-1-48)	Recovery Per Well (To 1-1-48)	Recovery Per Acre (To 1-1-48)	Average Net Pay
Wyoming	Laramie	Borie	Muddy S. S.	8-9-49	Geol.	160		8,484	A	38.4	40	1	173	.....	.....	.....	.....	..
	Laramie	Horse Creek	Muddy S. S.	Oct., '42	Seis.	2,560		5,400	A	35	40	25	1,700	67,489	#327,548	(16 W) 20,472#	512	25
	Laramie	Horse Creek	Lakota S. S.	Oct., '42	Seis.	300		5,500	A	32	40	0	....	0	36,000	(3 W) 12,000#	100	15
	Albany	Seven Mile	Muddy S. S.	9-15-47	Seis.	230		5,833	A	34	40	1	44	14,122	14,122	(1 W) 14,122	353	..
Nebraska	Cheyenne	Gurley	1st Dakota S. S.	7-16-49	Seis.	160		4,401	A	33	40	2	S.I.	....	.....	.....	....	20
Colorado	Larimer	Berthoud	Muddy S. S.	July '29		200	1,310	3,750	A	38.5		1	5	2,053	75,307	(1 W) 75,307	1,882	7
	Boulder	Boulder	Pierre Sh.	Jan., '01		400		2,500	MT	42.0		2	6	11,000	708,237	(60 W) 11,373	1,770	..
	Larimer	Clark's Lake	Muddy S. S.	Feb., '44		200		5,888	A	38	40	5	75	38,421	260,421	(5 W) 52,084	1,302	20
	Fremont	Florence	Pierre Sh.	1876		9,000		1,000	MT	31		72	75	25,348	13,963,740	(535) 26,100	1,552	..
	Larimer	Fort Collins	Muddy S. S.	Aug., '24		520		4,300	D	37		8	90	5,150	2,357,587	(18 W) 130,977	4,534	..
	Larimer	N. Ft. Collins	Muddy S. S.	1944		40		4,750	D	..		..	.....	.....	36,500	36,500	913	25
	Morgan, Weld	Greasewood	Muddy S. S.	Oct., '30		300	1,500	6,650	AF	42.0		2	30	7,063	502,785	(5 W) 100,557	1,676	15
	Larimer	Wellington	Muddy S. S.	Dec., '23		1,920	1,250	4,210	D	37.0		11	140	100,612	5,454,062	(31 W) 175,937	2,840	40-70

B. Gas Reservoirs

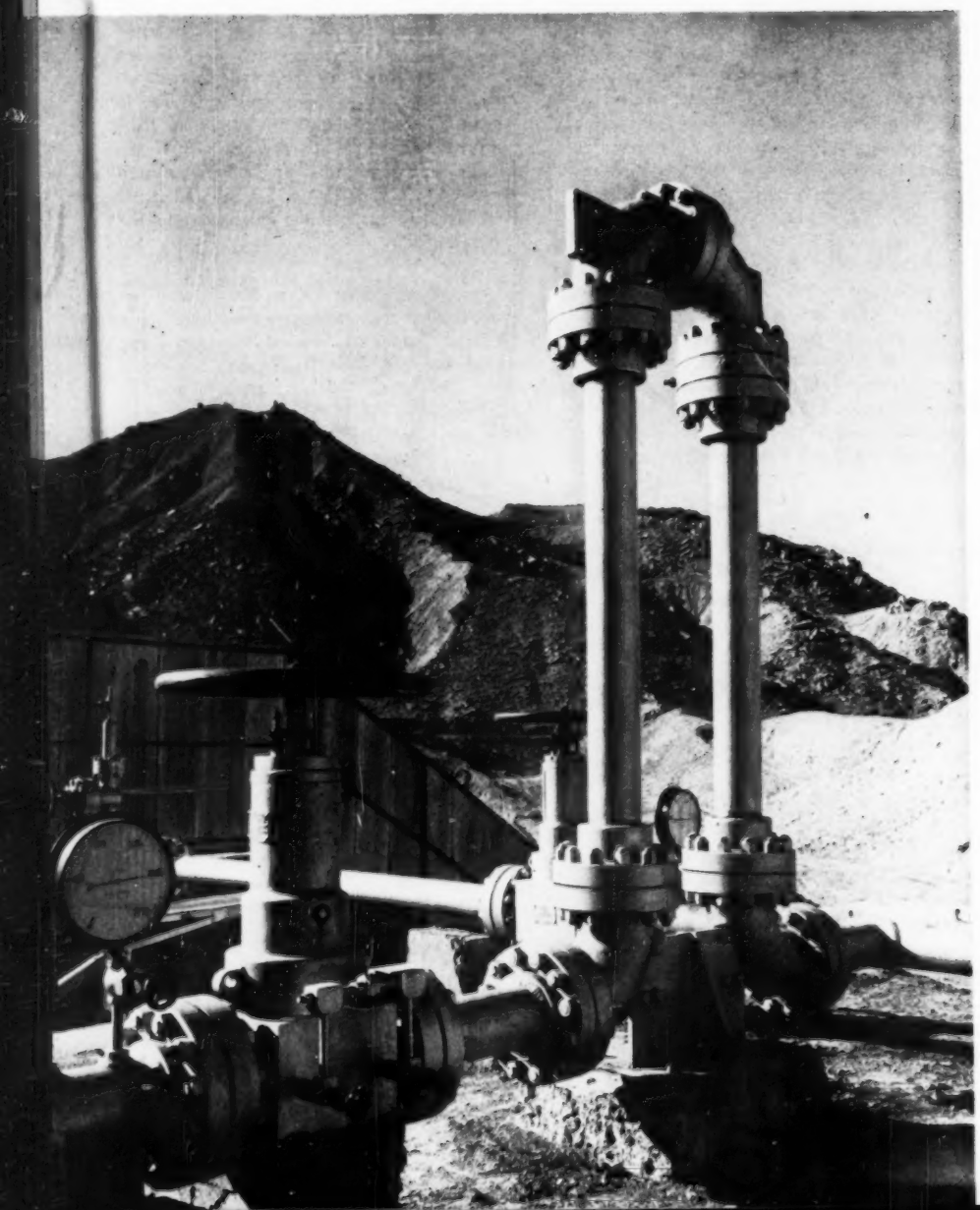
														MMCF	MMCF			
Colorado	Weld	New Raymer	Dakota S. S.	Feb., '33	—	640	1,800	6,692	MH	...	..	0	....	.....	.....	(1 W)	...	6
	Yuma	Wray	Niobrara Sh. S.	Jan., '19	2	....	400	1,472	D	...	..	..	....	.....	.....	(6 W)	....	10
	Larimer	Berthoud	Pierre Sh.			....	1,310	3,750		..	..	2	....	31	961	(4 W)	....	5
—	Larimer	Wellington	Muddy S. S.	Nov. '23		200	.....	4,265	A	..	..	..	....	.....	.....	.....	....	40-70

Horse Creek field production figures are to Jan. 1, 1949

DRILLING AND PRODUCTION PRACTICE IN OIL FIELDS OF SOUTH IRAN

By H. W. Lane

Automatic flow-limit valve on high-pressure production line, Agha Jari Oilfield, South Iran.



DRILLING for oil in south Iran is beset with many difficulties, due both to peculiarities of the formations and the high pressures encountered which must be met with special techniques and safety measures. The depths and pressures of these fields are shown in Table I.

Table I

Field	Discovery Year	Depth Range-Feet	Reservoir Pressure-psi
Masijid-i-Sulaiman	1908	1,000-3,500	450-750
Haft Kel	1927	2,500-4,750	1,175-1,800
Gach Saran	1928	2,750-7,500	2,050-3,500
Naft Safid	1934	3,000-6,300	3,000-4,000
Agha Jari	1937	5,000-9,000	3,150-4,500
Lali	1938	5,000-8,000	3,050-4,000

In general terms the purely mechanical operation of excavation is not difficult. Rock bits are used exclusively, since the predominantly hard and soft beds through which the drill passes can be drilled almost as rapidly as by suitable types of drag type bits. Drilling speeds are low by world standards, and although 250 feet per day can on occasion be logged, the average footage is more on the order of 1,000 feet per month. The reason for this comparatively slow rate of progress may be attributed to three factors: (1) pressure conditions encountered in certain sections of the hole; (2) a rigid policy of safety, and 3) difficulties in servicing.

The geological sequence of strata in southwest Iran from the driller's point of view falls naturally into four divisions (Figs. 1, 2). The highest —the Bakhtiari under Upper Fars Series—comprises up to 10,000 feet of marls and sandstones in which drilling difficulties are confined to water shows and considerable mud losses. This series is normally drilled with a plain, shale-water mud, with or without the addition of bentonitic material.

The next division, the Middle Fars and Lower Fars, Stages 3 and 2, averages 2,000 feet in thickness and comprises marls, thick anhydrite beds and thin limestones and is notable for high pressure water and gas shows. A shale-base chemically treated, bentonitic mud weighted with barytes is normally in use in these formations.

The Lower Fars, Stage 1, is a variable series of anhydrites, marls, salt and limestones, which flows plastically under differential stresses and may vary in thickness from nil to 10,000 feet in the course of two or three miles. It gives rise to particular difficulties in drilling, including squeezing and mud contamination. The maintenance of stable bentonite suspension, especially in thick masses of salt, is a problem peculiar to the division.

In this series salt water shows are common. These shows can put up very high pressure. Conditions are so complex that the pressure of an upper show may be higher than that of a lower show so that mud of a gravity necessary to hold the upper

* Condensation of paper presented before Fourth Empire Mining and Metallurgical Congress, London, July 1949.

show will be lost in the formation of the lower show because of the high differential pressure. This differential increases as the hole gets deeper, and mud ringing and losses to the formation often become so serious that progress is completely arrested. Cement is rarely effective since the salt water dilutes the cement and destroys its action. If the mud is of insufficient gravity, that portion standing in the hole between the two shows will become diluted by the interchange of salt water between the two shows. The aim, therefore, is to deal with each show as it is encountered. The caprock, a largely anhydrite formation, averages 100 feet in thickness and gives warning of approach to the immediately underlying oil-bearing Asmari Limestone.

The petroleum reservoirs in all these fields are large anticlinal structures of Lower Miocene to Oligocene age and known as the Asmari Limestone, the porosity of which, as far as is at present known, varies between two and 15 precent, the average being about five percent. Complete information is not yet available from the newer fields but it would appear that they may be of even higher porosity.

Large accumulations of petroleum are trapped in these anticlines by salt water below and the impermeable caprock and the plastic rocks above. In the crests of the domes, gas caps are usually found, though if seepages have been active through a fracture in the caprock these gas caps may be small.

The intense folding and flexing of this rock mass has cracked and fissured it extensively, and this fissure system is responsible for the very free fluid connection throughout the reservoir, which is the feature of these fields. These fissures are small, being normally less than 1/10 inch in width, and they do not contribute a large proportion of the storage space in spite of the fact, that when a well is drilled, no appreciable production is obtained until a fissure is penetrated, even though the drill may pass through bands of highly porous rock. Though opinions vary, it is generally estimated that at least 80 percent of the recoverable oil is stored in the porous limestone, with only 20 per.ent in the fissures.

The Asmari Limestone Series may be up to 1,500 feet in thickness and is dominantly a formation of bedded and massive, varying porous and fractured limestones with some anhydrite and marly beds in the lower portions. Pressures within the oil and gas zones are frequently high and require a high degree of flexibility in pressure control. Such conditions are prevalent in most of the Iranian fields. Though very careful mud control is sometimes successful, the most effective method so far tried is that of pressure drilling.

Two casing programs are in use. Where high pressures are expected and special technique must be employed, "inserted joint casing" is used. This type of casing is for pressure-drilling wells where extreme depth is not an objective. In wells where more normal drilling conditions exist, standard API collar casing is run. For deep strings where clearances are small, extreme-line casing is used. This casing employs a special joint having a high tensile efficiency and streamlined external and internal form which minimizes friction in a packer or in the open hole, and reduces pumping pressures.

Drilling is commenced in a 19½-inch hole and carried to between 500 and 1,000 feet, where 16-inch API casing is cemented to form an anchor string. A well head which includes a 15-inch valve and Cameron gate are fitted and drilling is continued, using a 14¾-inch bit to a point between 3,000 and 3,500 feet. In most areas this takes the well to a point at the base of Stage 3 in Lower Fars, and water shows in this section of the hole can be shut off. Here 11¾-inch casing is cemented to surface, after which the well is rigged up for pressure drilling and a special well head installed.

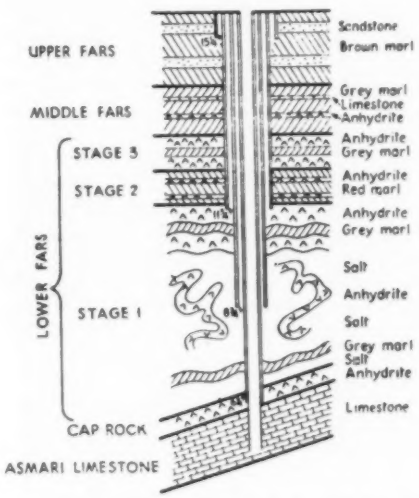


Fig. 1: Stratigraphical Diagram of a typical well showing the casing program.

Using a 10⅝-inch bit, the hole is then carried to a depth of 5,000 to 6,000 feet. This section is extremely difficult; 8¾-inch casing (I.J.) is cemented at a point designed to shut off as much as possible of this troublesome formation, and the hole is continued to caprock with a 7¾-inch bit, 6¼-inch I.J. casing being run and cemented in caprock. A special drilling-in well head is here installed and drilling-in for production is commenced. All casing strings are cemented to surface and tested to full pressure before drilling is recommenced.

Most of the drilling muds in use in these fields are made from a base of grey calcareous marl. With this material fresh water mixtures can be made up to 1.28 specific gravity having reasonably low viscosities. Sealing compounds, weighting materials, viscosity reducers and gelling compounds are added to suit required conditions. Salt water mixtures can be made up to 1.45 specific gravity.

Although it is simple in the laboratory to design a suitable mud, it is extremely hard at the well to keep it in condition. Salts dissolved from the formation of the drilled material itself rapidly affect mud stocks, while a very small amount of cement will render a large mud stock absolutely useless. It has been found that if two percent of fuel oil is thoroughly gunned into the mud, the basic particles become coated in such a manner as to arrest reaction with the chemicals introduced from the formation. Starch will also afford this protection, though it deteriorates rapidly in quality. Recent experiments with carboxymethycellulose (cellofas) have proved most successful.

Fig. 2: Section through Agha Jari Structure.

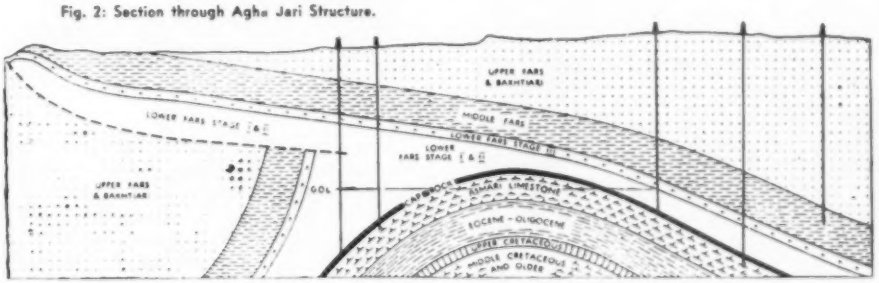
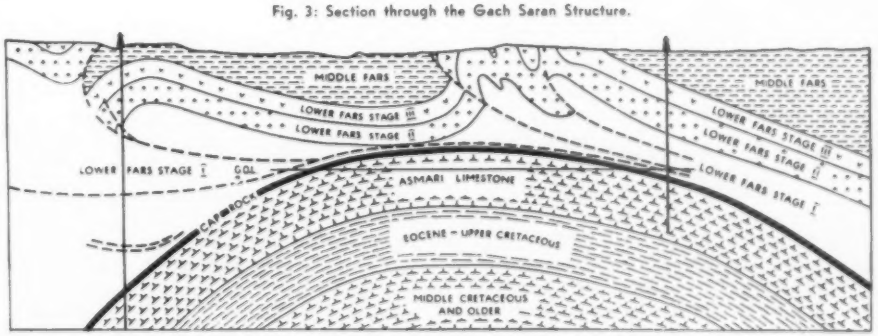


Fig. 3: Section through the Gach Saran Structure.



The term pressure drilling means the imposition of a mechanical back pressure on the well during drilling so that the formation pressure can be balanced and controlled by a mud column of a lighter gravity than would otherwise be necessary. There are two methods: The closed method, whereby the mud returns from the well are taken through a closed vessel in which mud screens or settling devices are installed and which work under full control pressure; in this method the pressure of the mud never falls below the control pressure and slush pump capacity is, therefore, reduced. The other is the open method whereby the mud returns from the well are discharged through beans which maintain the pressure on the well by restricting flow.

Full pressure drilling is essential in some wells, but in general a system of semi-pressure drilling has been adopted. The wellhead for drilling under pressure consists of a Cameron gate, a Seamark hydraulic packer capable of shutting off any part of the drill string and permitting vertical movement, and a double-deck stuffingbox which provides the shut-off while drilling.

Side line connections are taken from above and below the Cameron gate and are connected to twin cutting separators and adjustable beans which discharge onto a vibrating screen over the mud return flume. A third adjustable bean controls a line for direct return from the hole to mud reserve or gas-cut mud tanks. Normally returns are taken from above; the Cameron gate and the connections below it are for emergency control when the gate has been closed round the drillpipe.

A composite 4½-inch API full hole and flush joint drilling string is used. Three non-return valves are employed in the drilling string and one on the mud delivery line to the wellhead which automatically checks pressure release in the event of any failure on the pump discharge side.

Pictures from Anglo-Iranian Oil Co. Ltd. No. 6 well, Naft Safid Field.

An automatic spider or grip is fitted which prevents drill pipe being blown out of the hole in the event of failure near the surface. Each adjustable bean is master-controlled by a cock, which can be shut when circulation is stopped or in an emergency. A back-pressure recording gauge is mounted at the driller's control panel and a duplicate reading is continuously shown on the well pressure line to the hydraulic accumulator of the Seamark packer.

The saying that "prevention is better than cure" has never proved truer than when applied to drilling these formations, and so, in practice, pressure drilling is begun before there is any actual evidence for its necessity in each hole. Sooner or later in every case it has proved essential, and it has been observed that if one caving or squeeze or gas or water entry takes place at any point in the formation in sufficient degree to cause pressure disturbance, then the whole open hole may be affected adversely and as much as 2,000 feet of previously faultless hole may cause continual trouble until cased off.

An appropriate back pressure to boost the head of the drilling mud is maintained on the formation continuously so long as the bit is working in the open hole. When it becomes necessary to pull out, a heavier mud is circulated into the casing after the bit has been pulled up inside the casing shoe; with the casing filled to surface with this heavy mud, the drill pipe is pulled out. When running in with the bit at the casing shoe, the well head is closed and the reverse mud-exchange takes place. On the way in, the drill pipe is filled with drilling-gravity mud, and as the heavy mud is circulated out of the annulus the appropriate back pressure is gradually built up. When the exchange is complete and the column stable, the bit is run to bottom and drilling proceeds.

The success or failure of pressure drilling the difficult series of formations depends mainly on the maintenance of stable pressure conditions on these formations. To achieve such conditions good equipment and a first-class active-minded crew are essentials.

The factor most likely to cause fluctuating pressure conditions is the back pressure; the sudden failure of a pump or line or carelessness on the part of a bean operator are two possible causes. Therefore, it is considered that the use of the heaviest reasonable mud with lowest back pressure is the soundest practice. Although a heavy mud may be more expensive to use and may even cause shutdown time on account of reconditioning, it does provide better stability as well as a greater flexibility factor against a sudden demand for increased pressure, and the lower back pressure required effects a big saving in wear and tear of all surface equipment. In drilling with a gravity of 1.3 mud and 1,200 psi back pressure, the hazard of pressure variations on bottom is far higher than when using a gravity of 1.75 mud and 400 psi back pressure. Although this system of semi-pressure drilling means poorer footage, some loss of drilling time and apparently slow progress, the inevitable troubles which accompany any attempt to penetrate these formations with open circulation make the simpler practice the less attractive of the two propositions.

The operation of drilling through the main reservoir rock for production is one requiring the utmost care, and it is usual to employ only very experienced drillers on this work. The careful balance which must be kept requires constant watch on the mud, and when mud losses start to occur, instant action is required.

The wellhead used for drilling-in is designed to carry out a multiplicity of operations. It includes a Seamark blowout preventer, connected up so that the pressure of the well itself is applied to closing it. If pressure in the well rises, it is automatically applied to the blowout preventer rubber round the drill pipe and is amplified to a pressure higher than that of the well by the action of a weighted plunger. Below this is fitted a second blowout preventer of the Cameron type which may be closed from a remote control by steam or hydraulic pressure or by hand. These devices are of specially robust design, capable of withstanding pressures from 6,000 to 10,000 psi.

Mud must be of low permeability so that mud ringing in the porous zones is minimized. When open formation is struck, as in the case of striking a fissure, mud losses immediately occur. These losses may be so high that circulation is entirely lost. If losses were to continue until all stocks of mud had been used up, there would be some danger of the well coming in and developing a high wellhead pressure. It is, therefore, necessary to hold a reserve of special viscous mud in storage ready for use. This mud may be mixed with cellophane, mica or other flaked material.

It is necessary from time to time to drill wells through the gas dome for the purpose of producing from an exploratory well which has entered the reservoir rock above gas oil level. This operation is one of great hazard. The weight of the mud column must be equivalent to the pressure in the gas dome plus a safe differential. As the hole grows deeper, this differential increases and it is possible under certain conditions to be carrying a 1,000-pound differential on the formation at the bottom of a hole which has started at the top of the dome with say only 250-pound differential. If the well strikes a fissure under these conditions, the mud loss may be such that stocks are exhausted and the well is liable to come in with the drill pipe in the hole before the producing formation can be mudded off.

Although every possible safety device may be fitted and be in good condition, there is still danger that the well may get out of control. The solution is again the employment of pressure drilling since it enables a lighter mud to be used and the differential does not increase at the same rate with depth; a much more delicate control is also possible, since the striking of a fissure or open formation of any kind will be immediately registered at surface by a drop in control pressure at the wellhead, and suitable measures can be taken.

In this operation also highly-viscous mud mixtures and sealing compounds must be held in readiness for the shutting off of open formation. Two main valves are fitted which remain on the well after completion. The top valve is the working valve used for closing in the well when the tools are out of the hole, but the lower valve or master gate is never closed until the well is completed. This valve is filled with grease at the commencement of operations and is the last line of defense. It is kept in reserve in case the upper valve fails or becomes damaged by the continual passage of tools in and out of the hole. Where possible the master gate is installed in a sub-cellar which can be flooded, thus affording protection in case of fire.

Correct safety practice is important in any oil field, but in these fields there are certain conditions which make it of even greater importance. Pressures are high, the wells are among the biggest producers in the world, and the reservoir connection is so free that a blowout on one well might conceivably drain the whole field. Therefore, the watchword has always been safety in drilling practice, in the equipment used and in the manner of installing it.

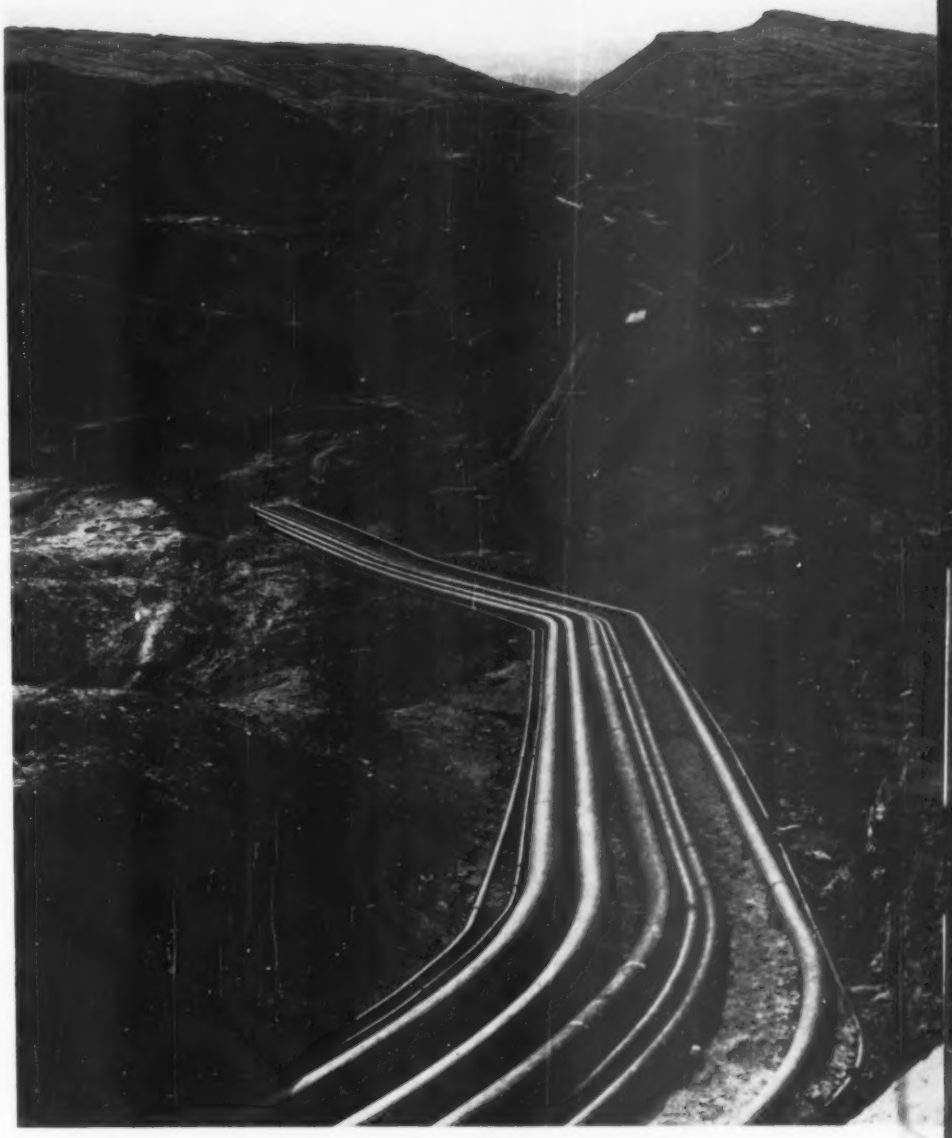
First it is necessary to ensure that the driller himself is familiar with emergency procedure in any situation and with the equipment which he has to handle. He receives, therefore, a complete schedule of drilling instructions which set forth his responsibilities. In addition he has a set of drawings of every item of equipment he is using and a set of safety regulations.

In the erection of the plant every possible safeguard for the crew is included, both in guarding against accident while working and in assisting escape in the event of a blowout. Routine tests of the equipment are made daily, weekly or monthly according to the degree of importance. Indicators showing the position of each valve are installed, those applying to the valves and blowout preventers on the well itself being designed so that they can be seen from the derrick floor and including an indicator showing the number of turns required to shut or open. Finally a log in detail is made of every item on the well head so that, when unapproachable through fire or blowout, the repair crew may know exactly what fittings have to be allowed for in their operation.

As soon as possible after production commences, it is necessary to collect certain physical data so that the production program of the field can be planned on sound scientific lines. Gas, oil and water levels and pressures must be accurately observed and regularly recorded under uniform conditions, and since production wells, even if suitably sited, can seldom be spared for long periods, it is necessary to drill wells specially sited for observation purposes only. These wells are the pressure gauges and the gauge glasses of the reservoir, enabling a watch to be kept on water, oil and gas levels and on their movement as production is drawn off. The very large production rates cannot be safely maintained without an intimate knowledge of the reservoir conditions which may vary in different parts of the field. Overproduction in an area or a well may cause the drawing down of gas and the coning up of water, an effect which is immediately recorded if the observation wells are correctly sited.

The spacing of wells to obtain efficient drainage, so important in fields of limited permeability, does not have quite the same application under Iranian conditions. Migration is so free that a single well suitably sited can drain from great distances. The siting of producing wells is, however, important from the standpoint of insuring the longest possible producing life. The expanding gas cap and rising water level limit the area in which these wells can be sited to a ring extending round the flanks of the dome and aimed at a point where these levels will meet when production is exhausted. After the movement of these levels has been observed over a period of production, this point can be forecast with what will probably prove to be a fair degree of accuracy.

The distance between wells in the higher pressure fields is governed to a certain extent by surface development demands. In the Agha Jari field the flowing capacity of wells is high, the average producing capacity per well being about one million tons annually. Since production units are now designed for a throughput of eight million tons annually, a group of eight to ten wells is required to feed one central point. The length of produc-



Pipelines crossing broken country in Agha Jari, Southern Iran.

Gach Seran, with distant view of Sehqalatun.

tion flow lines on the surface has to be considered, since in the very broken terrain in this field the laying of long, high-pressure, graded lines is a matter of some difficulty. An arbitrary limit of four miles was fixed for these lines, and a well spacing of one mile adopted. This interval appears to suit producing conditions in all respects and is, moreover, a convenient step making the geologic allocation of wells relatively simple.

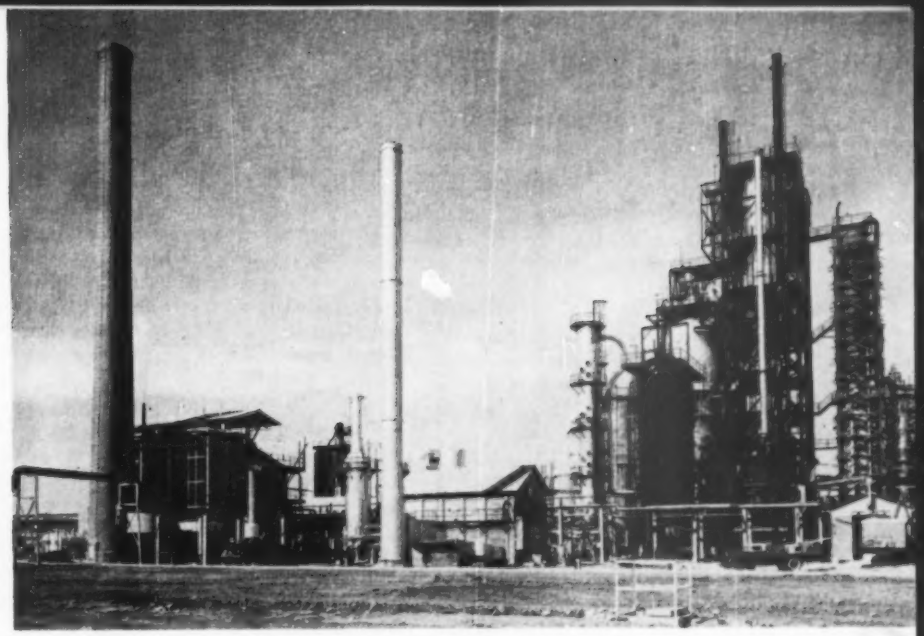
Wells intended for production are drilled into the reservoir rock until mud losses indicate that open formation has been struck. The well is then bailed down until the pressure of the oil lifts the mud column and the mud is flowed out. When all mud has been removed, the flowing capacity of the well is measured at the required pressure. This pressure is not necessarily that at which the well gives its highest production.

In order to achieve the best possible flowing conditions the minimum differential in bottom hole pressure must be aimed at, and though wells in all fields except M-i-S are usually capable of producing 500,000 gallons daily at the initial test, acid treatment is nevertheless applied. The reservoir rock is readily attacked by hydrochloric acid which enlarges the fissures; and few wells fail to respond to acidizing. In open formations three or four treatments are sometimes necessary, 1,000 gallons of inhibited acid being forced into the formation and left for periods up to 16 hours. In tighter formation it has been found that better results are obtained with shorter periods, since the products of reaction tend to mud off the formation thus nullifying the effects. Wetting agents are sometimes used and a deeper penetration usually results. The production of wells is invariably increased, and productions of the order of one million gallons daily are frequently achieved.

Gach Seran—a producing well and gas/oil separator.

Crude oil flowing from the well first passes through a flow controller which regulates the amount required from the well. It next passes into a high pressure separator which takes off all free gas. From this separator it is delivered through a graded pipeline to the central stabilization unit. Embodied in this assembly is a safety device which automatically cuts off the flow from the well in the event of a failure in the system. During the war much thought was given to the safety of these fields from damage, and an ingenious differential valve was designed which could be set to pass certain rates of flow. If this flow were exceeded, the valve closed and cut off the flow entirely. Although originally intended to be set in the bottom of flowing wells, the application to surface plant was soon realized, and every production well assembled is now so equipped.

SECOND MODERN BILLINGS REFINERY COMPLETED



Partial view of Continental plant showing boiler plant at left, crude furnace in center and catalytic cracking and desulfurization plant at right.

CONTINENTAL OIL CO. opened its new $9,500,000 refinery at Billings, Montana, on October 8 with an open house for the public and addresses by Governor John W. Bonner and other officials. It was the second time in less than two months that Montana's Governor has been called on to dedicate a large modern refinery at Billings. On August 26 he participated in ceremonies attendant on the opening of the 30,000-barrel Carter Oil Co. plant.

Development of new fields in the Rocky Mountain region and the growing demand for petroleum products in the mountain states has stimulated a very large refinery building program in the area since World War II. Before the war the capacity of all refineries in the area totaled 123,000 barrels daily. Many of the plants were quite small, serving only a limited area. Today refinery capacity in the states of Colorado, Wyoming, Utah and Montana totals 219,750 barrels daily and will be enlarged even more within the next year. Socony-Vacuum Oil Co. is increasing the capacity of its Casper, Wyo., plant to 6,000 barrels daily and Salt Lake Refining Co. is busy enlarging its Salt Lake City plant. This refinery went on stream only a year ago, and already the company is spending another $10 million to expand the capacity to 24,000 barrels daily.

Construction of catalytic cracking units has fea-

Aerial view of Continental's new Billings, Montana, refinery

tured all of the new postwar projects in the Rocky Mountains. Standard Oil Co. of Indiana and The Texas Co. have built such plants at Casper since the war. The new Carter, Salt Lake and Continental plants all include cat crackers and Socony-Vacuum is building a cat cracker as part of its current program.

With the field developments in the Mountain region as described elsewhere in this issue and the vast new resources being developed across the border in Canada's prairie provinces, it seems clear that adequate supplies of crude will be available for the new plants for years to come.

Typical of the new postwar plants, Continental's newest refinery at Billings is of the most modern design and contains a crude fractionation unit, propane deasphalting, catalytic cracking, catalytic desulfurization, catalytic polymerization, and LPG facilities. Copper sweetening will be used for the straight-run gasoline and doctor sweetening for the heating oils. All the units are designed for balanced operations with no intermediate tankage. Interconnecting instrumentation coordinates the operations as the streams pass the various units.

The crude unit is designed to process 7,555 B/SD of a mixture of Elk Basin and light Frannie crudes having a blended gravity of approximately 28.1° API and a sulfur content of 2.2 weight percent. The crude is charged to the unit through bottoms-feed and circulating reflux-crude exchanger system where the temperature of the crude is raised to 470° F. and is then heated to approximately 750° F. in a conventional tube still heater before passing into the crude fractionating tower. This tower is seven feet in diameter and contains 16 trays. The crude is fractionated into three streams consisting of:

Stream	Percent on crude	Gravity ° API
600° F. EP overhead	47	
Gas oil	15	24.8
Reduced crude	38	12.5

The overhead vapors contain the straight-run gasoline and heating oils which are subsequently catalytically desulfurized in the treating reactor. The gas oil provides part of the charge to the fluid catalytic cracking unit, and the reduced crude is the charge to the propane deasphalting unit.

The propane deasphalting unit is used to prepare a clean heavy gas oil for charge to the fluid catalytic cracking unit, with the residual asphalt stream blended to fuel oil with cycle gas oil. It is designed to process 2,870 B/SD of reduced crude and produce a net overhead product of 1,985 barrels of 21° API gravity gas oil and a bottoms asphalt product of 885 barrels of a minus 3.4° API gravity. The unit consists primarily of a surge drum for the propane solvent, charging equipment for the reduced crude and propane, a countercurrent tower where the actual asphalt separation is effected, and equipment for recovering the propane solvent.

The reduced crude feed comes directly from the crude fractionating tower, passing through a cooler to reduce its temperature to 160° F. Three reduced crude feed entrance nozzles are provided in the upper half of the extract tower although only one will normally be used. The extraction tower is nine feet 7½ inches in diameter and contains 16 perforated plates for assuring intimate contact between reduced crude and the propane solvent. Ten steam heating coils are located in the upper two-thirds of the tower. Steam to these coils is regulated by a temperature recording controller to maintain a constant top tower temperature. The solubility of the gas oil in the propane varies with the temperature; so the quality of the gas oil product is regulated by this temperature control. The propane solvent circulation will be 17,000 barrels per day, which is a 6:1 ratio on the reduced crude feed. This propane is injected into the extraction tower in the bottom section, and it flows upward countercurrently to the asphalt which collects in the base of the tower. A pressure of 500 pounds is maintained on the extraction tower by a pressure controller on the overhead gas oil-propane stream. The propane is recovered from the gas oil in three stages, namely, the first stage evaporator, second stage flash, and deasphalted oil stripper operating at 305, 205, and two pounds gauge, respectively.

The asphalt stream from the base of the extraction tower consists of approximately equal quantities of asphalt and propane. This mixed stream is heated to 600° F. in a vertical upshot heater and from there passes to a flash drum operating at 205 pounds where most of the propane is removed. The remainder is taken out in the asphalt stripping column operating at two pounds gauge. A compressor is provided for recovering the propane removed in the two stripping columns operated at two pounds, delivering the propane to the solvent condensers, thereby effecting efficient propane recovery.

The catalytic cracking unit is of the fluid type designed to process 3,770 barrels per day of 23 to 25.5° API gravity virgin gas oil. It will operate at 79 percent conversion while recycling approximately 5,000 barrels per day of cycle stock. Silica-alumina microspherical type catalyst will be used. The virgin feed to the reactor is as follows:

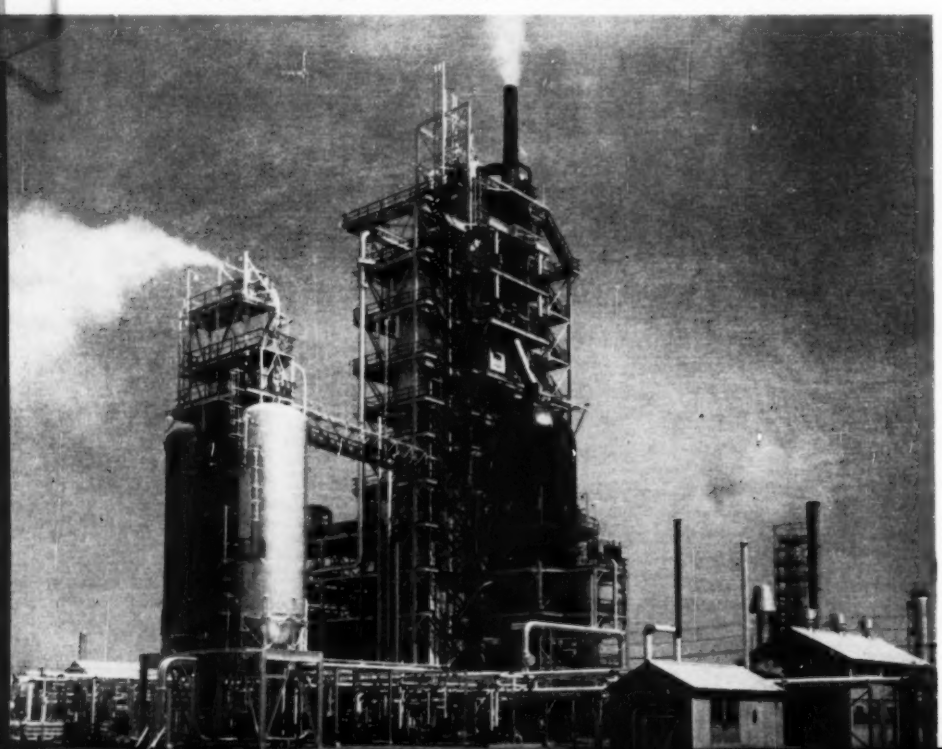
Deasphalted gas oil	1,985 B/SD
Atmospheric gas oil	1,130 "
Heavy distillates	665 "
Total	3,770 B/SD

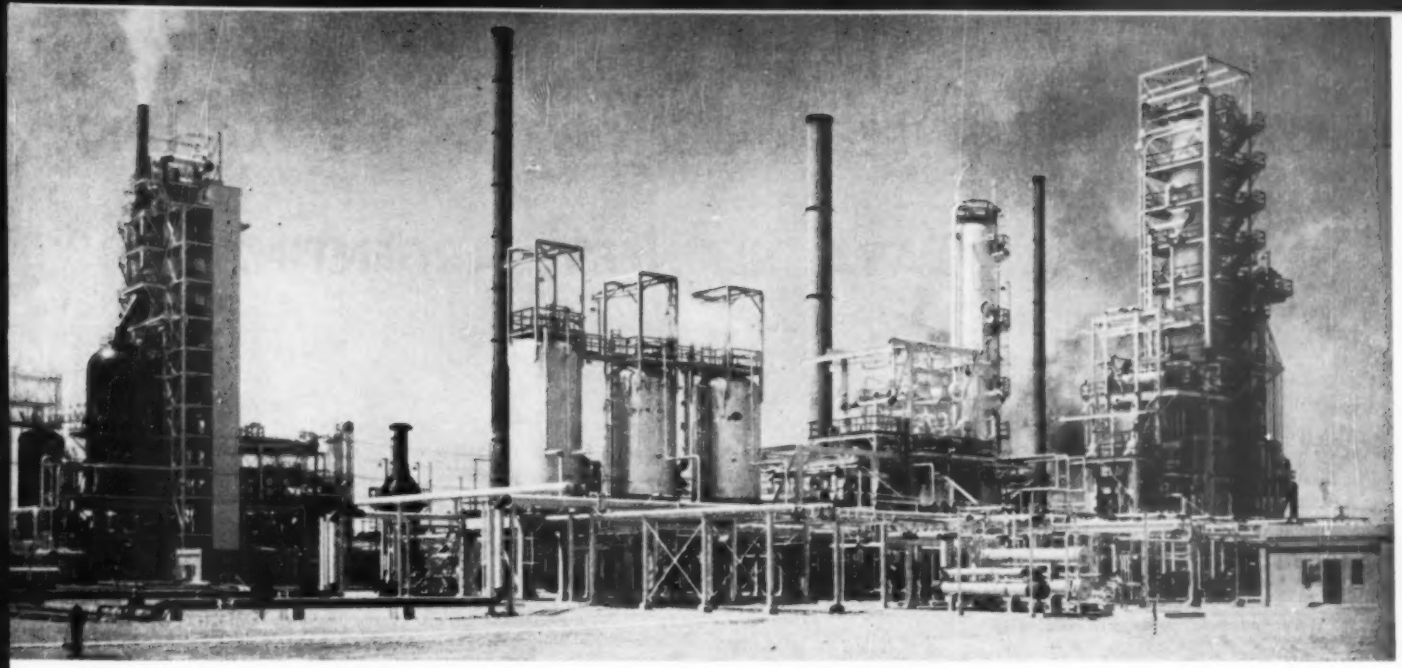
The yields expected from the cracking unit are:

Debutanized 400° F. EP gasoline	56 L.V.%
Cycle gas oil	21 "
Butane-Butylenes	15 "
Propane-propylene	11 "
Ethane and lighter	4 Wt.%
Coke	11 "

The reactor is 15 feet in diameter and contains an internal stripper for the spent catalyst leaving the vessel. Single stage cyclones are installed in the top of the reactor to reduce the amount of catalyst leaving with the vapors. Catalyst will be circulated to the reactor at the rate of 525 tons per hour. The reactor is installed high in the structure so that the spent catalyst flows downward from the stripper through a slide valve into the side of the regenerator. Following the reactor is the main fractionating column where gasoline and lighter are taken overhead while heavy naphtha and light cycle gas oil are produced from side stream strippers. Cycle stock from the main fractionator is circulated for reboiler oil duty in the gas concentration unit and for steam generation. The gasoline and gas pass to the gas concentration unit and cycle gas oil is withdrawn for fuel oil blending.

Catalytic cracking unit at Carter Oil Company's recently completed refinery at Billings, Mont.





Main process area of Carter Oil Company refinery, Billings, Mont.

The regenerator is 23 feet in diameter and 50 feet high and is large enough to reactivate the catalyst used in both the cracking reactor and the catalytic desulfurization or treating reactor. Two stage cyclone separators are installed in the regenerator to minimize the loss of catalyst with the flue gases. A waste heat boiler is provided to recover heat from the flue gas, generating 175-pound steam. The air for burning the coke from the catalyst is supplied by a centrifugal compressor driven by a 2,600-horsepower steam turbine. The design capacity of this unit is 25,000 cubic feet per minute from 13 psia to 39 psia.

A second reactor, 8½ feet in diameter, was installed in conjunction with the catalytic cracking unit. About 26 tons per hour of catalyst are fed to this reactor with the overhead vapors from the crude fractionation tower. Reactor temperature will be maintained at 700° F., which will substantially reduce the sulfur content of the straight-run gasoline and heating oils. The oil vapors pass from the treating reactor to the rerun fractionating system. The spent catalyst passes from the treating reactor through a stripper, standpipe, and slide valve into the regenerator which serves both the treating and cracking reactors. This method of installing the treating reactor with the cracking unit provides a continuous desulfurization system with a minimum of equipment.

Vapors from the desulfurization reactor pass to a rerun tower at a temperature of 700° F. Six separate streams will be produced from this 32-tray column. Approximate distillation ranges are as follows:

1. Overhead: 250° F. EP straight-run gasoline
2. First side cut: 250-350° F.
3. Second side cut: 350-400° F.
4. Third side cut: 400-510° F.
5. Fourth side cut: 510-600° F.
6. Bottoms: 600° F. plus

After debutanization of the overhead stream, the following quantities will be blended as shown in Table I.

The 617 B/CD will supplement the side cut gas oil from the crude fractionation unit and deasphalted reduced crude as feed to the catalytic cracker. All butanes and lighter from the rerun section will enter the Girbotol treater along light catalytically cracked gasoline and cracker wet gas production. A small motor-driven compressor will handle the fixed gas production from the reflux drum of the rerun column, discharging this stream to the Girbotol unit. The straight-run stabilizer will be refluxed with feed to the tower, the overhead vapors at 65 pounds gauge pressure venting to the discharge of the first stage compressor in the Girbotol unit. Two packed contact towers, one for treating liquid hydrocarbons and the other for vapors, will be used for removal of H_2S from these streams. The second stage compressor takes suction through a scrubber drum on sweetened gas and discharges through recontacting coolers (along with sweetened liquids) through a water separator drum and into an absorber-stripper column operating at 225 pounds. The de-ethanization accomplished in this tower prevents the necessity of recycling uncondensed vapors from the reflux drum of the subsequent debutanization step. From the 36-tray debutanizer, propane-butane overhead will be potential catalytic polymerization feed and 1,915 B/CD of debutanized catalytically cracked gasoline from the base of this tower.

The polymerization unit will be charged with 1,175 B/SD of mixed propane-butane feed containing approximately 50 mol. percent of unsaturates. To insure a sweet charge to the unit, the mixed feed is given a caustic wash. This is followed by a water wash, a water settling drum, and a surge drum. The charge pump will deliver fresh feed and "spent" butane (as recycle) to the reactors at a pressure of 1,000 pounds per square inch. Feed will first be heated by exchange with total effluent and then by steam generated in the process before passing through the two reactors.

The reactors are constructed of tube and shell design. Each reactor will contain 121 two-inch tubes 30 feet long. Catalyst will be placed in the tubes, and water circulated for cooling on the shell side. Each reactor will contain 4,300 pounds of UOP catalyst and will operate at a space velocity of 0.24 gallon per hour per pound. Effluent from the reactors, after heat exchange, will be fractionated in a de-ethanizer, depropanizer, and debutanizer operating at 350 pounds, 185 pounds, and 60 pounds, respectively. Propane will be sold as LPG, and butane will be sold directly and/or blended into finished gasoline. Approximately 400 B/SD of true polymer will be produced for gasoline blending. Design conversion for the unit is 85 percent.

Table I

Analysis of Streams from Rerun Tower

Stream	Produced (B/CD)	Tractor Dist. (B/CD)	No. 1 Dist. (B/CD)	Diesel (B/CD)	Straight Run Gasoline (B/CD)	To Catalytic Cracking (B/CD)
1	600				600	
2	798	90			708	
3	447	90	290	20	47	
4	622	80	145	155		242
5	417			175		241
6	134					134
Total	3,017	260	435	350	1,355	617

UNUSUAL DESIGN FEATURES YPF CRUDE TOPPING UNIT, LA PLATA REFINERY, ARGENTINA

NOW under construction at the La Plata refinery of the Argentine Oil Fields (YPF) are two identical 25,000-barrel-per-stream-day crude topping units which incorporate some novel design features. These include amounts of suspended water, a self-contained steam generation system and special provisions for the isolation of condenser and heat exchanger bundles for cleaning and repair.

This new plant will be a major unit in the program of Dr. Zanetti, Chief of the Ministry of Manufacturing, for expanding the government's facilities for the production of gasoline, kerosene and fuel oil. Catalytic Construction Company of Philadelphia was the contractor for the engineering and purchased the equipment for export. Houdry Process Corporation did the process design.

Negotiations were completed with the Catalytic Construction Company in the spring of 1948 by Senor Mario Laverello. On the latter's return to Argentina, Senor B. F. T. Bruera represented YPF during the period in which the plant was being designed.

Comodoro Rivadavia crude, which has been produced in the Argentine for many years, is available only in limited quantities. In establishing their long-range program, YPF, therefore, felt the new topping units should be capable of processing other South American crudes in more flexible supply. For this purpose a medium-light grade of Oficina from Venezuela was chosen.

The following table gives comparative yields of the products desired:

	Comodoro Rivadavia		Oficina	
	Vol.%	BPSD*	Vol.%	BPSD*
Light Gasoline	0.0	....	3.0	750
350°F EP Gasoline	10.0	2,500	20.5	5,125
580°F EP Kerosene	13.5	3,380	19.0	4,750
650°F EP Gas Oil	9.0	2,250	16.5	4,125
Reduced Crude	67.5	16,870	41.0	10,250
	100.0	25,000	100.0	25,000

*42-gallon barrels per stream day.

It will be noted from the yields tabulated that the total percentage of overhead or vaporized products (gasoline, kerosene, gas oil) is radically different, totaling 59 percent for Oficina as compared to 32.5 percent for Comodoro Rivadavia. Conversely, the make of reduced crude from the latter is two-thirds greater than for Oficina. These differences required special attention in the design of the unit. For example, the large volumes of gasoline and other overhead products dictated the size of the heater, the tower, the sidestream lines and exchangers and the maximum heat load for the overhead condensing system. Comodoro Rivadavia determined the exchangers and cooler for reduced crude.

Because of the heaviness and high viscosity of Comodoro Rivadavia crude, it often contains appreciable quantities of water. This is also possible with Oficina. A preflash system was, therefore, installed capable of handling 2½ volume percent of water in the crude. Cold crude containing water is preheated by exchange, first against the overhead vapors from the main tower and then the sidestreams. The crude picks up further heat from reduced crude to attain the temperature desired in the preflash drum. Water and light gasoline, if any, flash off and pass to an upper deck of the main fractionator.

Since steam is available in YPF's La Plata refinery only in limited quantities, the topping unit has been provided with a generation system capable of supplying its requirements when onstream. Cold feedwater is first preheated in a deaerating heater by direct condensation of exhaust steam. It then picks up additional heat

General view of YPF site showing structural steelwork for Alcorn furnace being erected.

First of three levels of concrete foundations for atmospheric crude topping unit.

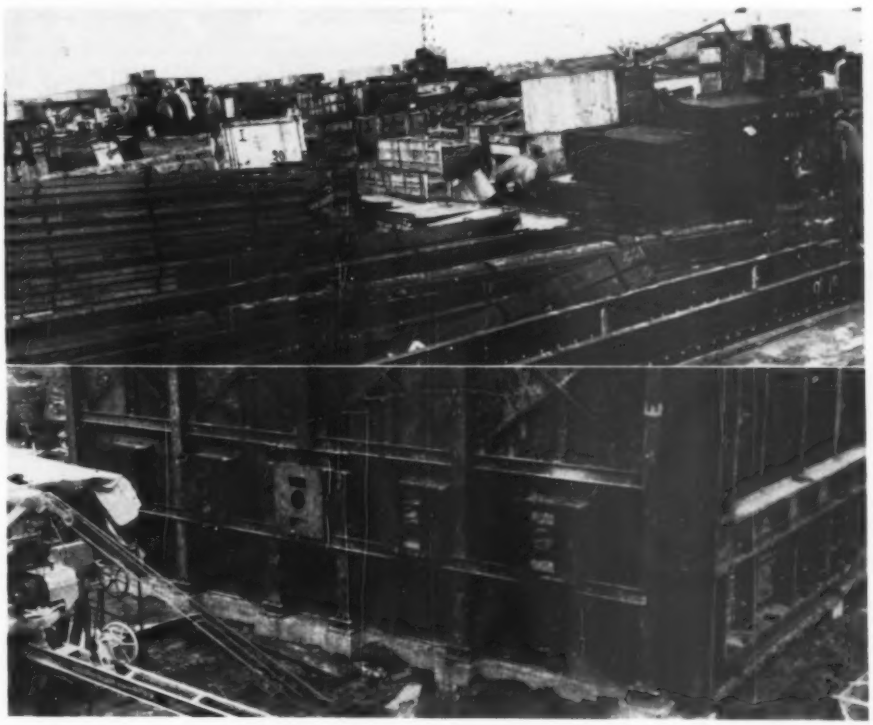
from reduced crude before it enters the steam drum. The main crude heater is provided with steam generation tubes in the convection bank instead of the more usual oil tubes. A circulating pump, taking suction from the drum, forces water through the heater tubes. Circulation has been set at several times the generation so that dissolved and suspended solids in the water will not form hard scale in the tubes. Since the heater will be fired primarily to attain a certain oil transfer line temperature, governed by the crude being processed, supplementary fuel burners have been installed in the furnace at the entrance to the convection section. In case steam generation is insufficient with any given crude outlet temperature, these burners can be lighted and the desired amount of steam generated.

In order to hold down-time to an absolute minimum and to avoid loss of capacity caused by operation for long periods with damaged tubes, exchanger and cooler shells have been provided with numerous block and by-pass valves. In the United States, because refiners are close to sources of supply, many of these valves are omitted, but with delivery times to the Argentine extending to many weeks or even months, special arrangements have been made. In most cases complete block and bypass valves have been installed so that individual bundles, or in some cases, two bundles together can be isolated, cleared of oil or gas and repaired. In other instances, particularly where leakage of a dark material, such as crude or reduced crude, could contaminate light products, individual bundles have been valved off. These valving arrangements will permit YPF to obtain long runs at sustained throughputs and to stagger much of their maintenance on tubular equipment rather than be forced to handle many items, all at once during a complete shutdown.

Because the refinery site has a soil bearing of only 500 pounds per square foot, the heavier equipment was set on pilings. In the early construction stages 1,053 pre-cast concrete piles were set. Wherever possible, reinforced concrete was used for structures instead of steel to reduce costs. The largest structure so designed is the atmospheric topping unit which is a rigid frame fabrication 38 by 42 feet and 50 feet high. Other notable features of the plant are a 20,000-gallon-per-minute down draft water cooling tower and modern package-type electrical switch gear.

Field construction started in April of 1949, and completion is expected early in 1950. Catalytic Construction Company's erection superintendent, John Roge, arrived in Buenos Aires in September to oversee the final stages of construction. Roge is a native of Buenos Aires and received his engineering education at Rensselaer Polytechnic Institute in Troy, New York. He has been identified with refinery construction for ten years with the Sun Oil Company at Marcus Hook, Pennsylvania, and as a field engineer for Catalytic.

Storage area for materials to be used in construction work.



Above. A later view of the Alcorn furnace.

Below. Form work and reinforcing at first level for atmospheric crude topping structure.

STRATEGIC IMPORTANCE OF OIL STUDIED

Naval War College Seminar Told that Healthy Domestic Oil Industry and an Adequate Foreign Operation is Necessary for Security in a National Emergency.

By David D. Lewis
Lieutenant, J.G., United States Navy

DURING a two-day seminar in October, 154 senior officers of the Armed Forces and State Department who are studying naval strategy, tactics and logistics at the Naval War College in Newport, R. I., were given the official word on the international petroleum picture and told of the necessity of taking it into consideration when formulating high-level plans and policies both during war and peace. The seminar, presented to officers especially selected to attend the college by reason of having an aptitude for higher command, was highlighted by a panel discussion bringing together civilian and military viewpoints on national petroleum policy and factors vital to the naval strategist.

Dr. Jacque C. Morrell and Mr. Paul L. Hopper, government petroleum consultants, and Colonel W. J. Worcester, USAF, deputy executive of the Munitions Board Petroleum Committee, Mr. Claire H. Dees, senior civilian industrial specialist of the committee, Cdr. George C. Shephard, deputy director of the plans division of the group, and Major William L. Latta, Jr., chief of the distribution section of the committee, came to the War College from Washington, D. C., to participate in the petroleum discussions.

Members of the college logistics department completed the make-up of the panel, which opened on Monday, Oct. 10, with a report on the history, locations, and potentialities of Western Hemisphere oil, given by Cdr. Charles Antoniak, USN, of the War college staff. In giving the background material, Commander Antoniak utilized information furnished the school by the Oil Information Committee and the American Petroleum Institute. Particularly interesting to the audience was a series of slides showing the armed forces oil consumption prior to, during, and after the last war. A comparison was also made between the oil reserves of the United States, Canada, Mexico and Latin American countries.

Part of Commander Antoniak's presentation was devoted to civilian and military consumption trends and the increasing economic and strategic dependence of the United States on petroleum products. He also gave the students a short outline of the history of the growth of the oil industry and the history of the proved oil reserves in the United States.

In covering the Eastern Hemisphere oil situation, Lt. Col. L. B. Smith, USAF, the second speaker, presented a brief survey on the locations of important fields and refineries in that part of the world, stressing the relative consumption rates versus production rates. In addition to showing the relative importance of the oil reserves in the East Indies, Europe and the Middle East, he traced the refining capacities and history of the developments of the various important fields.

Pictured listening to the lectures on world petroleum are (left to right) Dr. Jacque C. Morrell, who spoke on foreign oil, Vice Admiral Donald B. Beary, USN, president of the Naval War College, and Paul L. Hopper, who also spoke to the war college students.

A great part of his talk concerned the Middle East and the current petroleum production rates and estimated potential there. Because of its location and the immense size of its proven reserves, this area is intensely important to the naval strategist, particularly when considering strategy to be followed in the event of another war.

Colonel Smith's lecture was followed by the American Petroleum Institute Film "The Last Ten Feet." Also featured in the Naval War College library during the seminar was a display of pamphlets, books and magazines about world petroleum and the oil industry.

Dr. Morrell and Mr. Hopper led off the second day's discussion with talks on production capacities, oil reserves and consumption rates of various European and Asiatic countries. Dr. Morrell, a U. S. Army colonel during the last war, was Associate Director of Research and head of the Patent Department of the Universal Oil Products Company from 1921 to 1942. He was awarded the Modern Pioneer Award by the National Association of Manufacturers in 1941 and received the Legion of Merit from the War Department in 1945.

A fuels and power specialist, Mr. Hopper was stationed at Calcutta, India, as a Foreign Commerce officer from 1930-1933 and from 1934 to 1940 was chief of the Coal and Petroleum Section, Department of Commerce in Washington. He was in the Navy during the war.

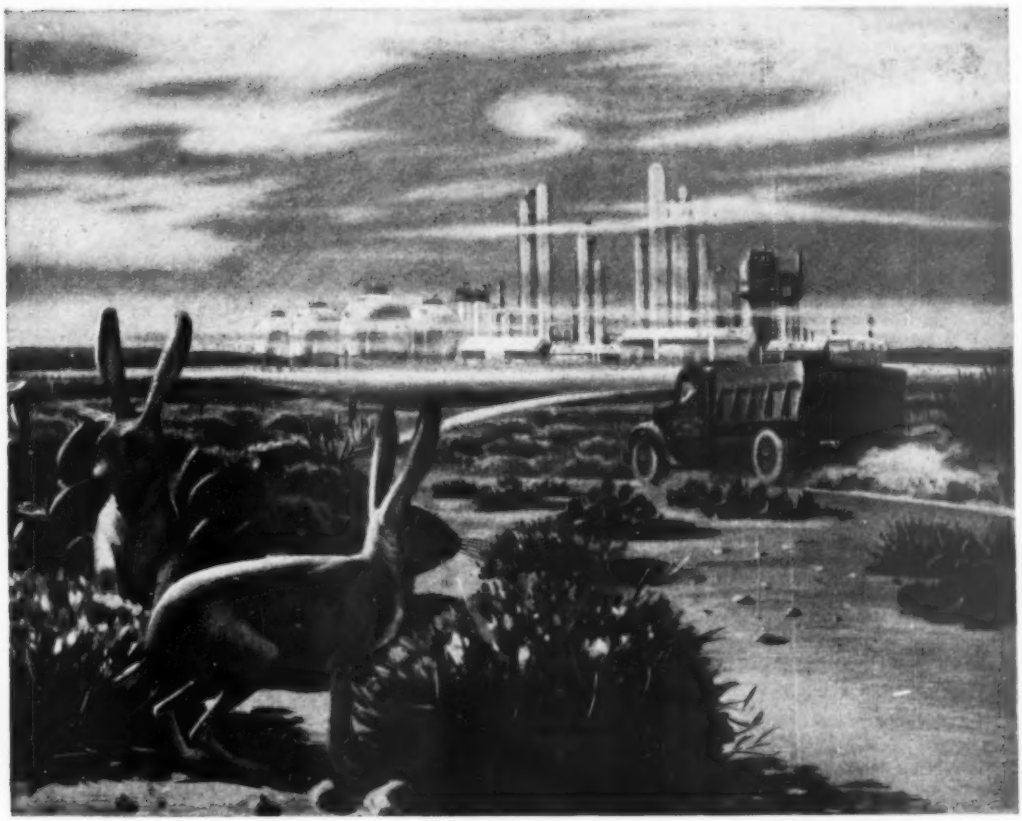
The Munitions Board petroleum group then took over the discussions with Colonel Worcester, the senior Air Force officer on the committee, talking on the problems of petroleum planning and distribution met by the military prior to and during the last war. Colonel Worcester was deputy executive officer of the Army-Navy Petroleum Board prior to serving with the Munitions Board. The Air Force officer told of past efforts to coordinate government and military procurement and planning procedures and viewpoints relative to the production of oil and its by-products. He concluded by giving a brief description of the governmental agencies and civilian groups which were organized during the war to effect the greatest efficiency in supplying petroleum to the Armed Forces.

Commander Shephard, a graduate metallurgist, then presented to the War College students, information about military petroleum requirements, and future requirements in the event of a national emergency. He gave consumption figures for both military and civilian, during and after the last war. A great amount of the material that Commander Shephard presented represented current official estimates of future consumption and production in the event of another war. Major Latta rounded out the Tuesday morning session with a lecture on petroleum distribution which augmented material presented by the staff on Monday.

The afternoon session commenced with members of the Petroleum Committee and the other Washington participants discussing and interpreting in broad terms the material that had been given in the other meetings.

Although all participants were members of the military or of government agencies, the oil industry opinions and viewpoints were given by Dr. Morrell and Mr. Dees. Mr. Dees worked with the petroleum industry for 12 years preceding World War II when he entered the service and was engaged in policy and technical work on high octane aviation gasoline.

There was a consensus that it is imperative that the petroleum industry must be kept in as healthy a state as possible for the good of the national



CONSTRUCTION SPECIALISTS FOR THE *Southwest*

If there is an industrial frontier in America today, it certainly lies in the rich, bustling Southwest. Brown & Root, Inc., started here more than 30 years ago. Our long association with the terrain, soil, working conditions, and people of this vast empire has established Brown & Root as this section's foremost construction and engineering company. There is no substitute for experience, and if you have Southwestern plans, Brown & Root can help you.

BROWN-BILT

BROWN & ROOT, Inc. *Engineers • Constructors*

P. O. BOX 3, HOUSTON 1, TEXAS

CABLE ADDRESS — BROWNBILT

Associate Companies:— BROWN ENGINEERING CORP. • BROWN & ROOT MARINE OPERATORS INC.

security. It was also brought out that the potential productive capacity of the United States alone would be inadequate in the event of a global war in the near future and that other areas which would be accessible during another war must be looked for. It was the opinion of the group that we must look toward the western hemisphere for these areas since the oil there would most likely be accessible.

However, the students were told that should there be a war in the near future, and with present estimates, all the petroleum production of our hemisphere would be necessary to meet our essential civilian and military requirements plus those of the rest of the hemisphere and some for our allies.

The question of importing and exporting oil was given much attention. It is the view of the Department of Defense that a balance between imports and exports must be maintained, the audience was told. Further explanation brought out that although the military wants and advocates conservation of our own resources, which would indicate favoring a limit on exports, they realize that a complete control would probably limit production in the United States. The panel agreed that to be a military asset, an oil field must be tapped ready for use with refineries and transportation available. Therefore there must be no unreasonable economic hindrance to the opening of new fields and increasing production.

The War College audience was told that there was no set formula for solving the problem of where to get all the petroleum necessary to fight any future war. As the international political situation changes, as new oil fields are opened up, as production methods change, it is necessary to shift one's viewpoints to meet the changing conditions. Since the world petroleum picture is ever-changing, the strategist cannot adopt a certain dogmatic attitude and then hope to have the fuel he needs. His thinking must be objective and fluid to be easily adapted to the current oil trends.

The possibility of stockpiling petroleum was discussed along with the manpower and steel necessary to carry out a program of that type to any great extent. It was brought out that only stockpiling of specialized oil products would probably be feasible in the face of the present steel situation. Throughout the discussions, the students were told that the economic as well as the military security of the country must be taken into consideration whenever making decisions relative to petroleum.

At the conclusion of the talks by members of the panel, the student officers participated in a question and answer period. The middle Eastern oil situation brought out the most discussion particularly relative to current imported oil prices as compared with the price of U. S. oil. The unitization system of conservation was also talked over with an excellent explanation of how it works, given by Mr. Dees of the petroleum committee.

Shale oil came into the discussion when a question was asked relative to the potentialities of shale oil production. Dr. Morrell, who had two papers on the subject back in 1918, and Mr. Dees brought out that there is an existing potentiality of shale oil, that it is being produced, but that to produce it, more steel per barrel has to be used than for ordinary oil processes.

At the end of the two day seminar, the student officers had received a short but thorough briefing on where the oil can be found in the world, how much there is of it, and what factors are involved in getting it out of the ground and using it in the United States.

There was a general feeling that the information received would assist the student in not only his work at the Naval War College, which is the highest educational institution of the Navy, but as he advances in his career. The material given was not slanted toward any one service since over one-third of the officers in attendance were non-Navy students. Representatives from the Air Force, Army Marine Corps, Coast Guard, State Department and the Navy were in the audience.

Certain obvious conclusions could be drawn from the material presented. The military forces are in favor of conservation and stockpiling, as much as possible, but without weakening the economy of the oil industry not only in the United States but in the whole Western Hemisphere. Another conclusion that could be drawn is that a balance of imports and exports is favored by the military in order that there will be some conservation of the oil in this country, but at the same time, the oil industry will, again, not be hurt economically and thus not drill new fields or increase production. The students were told the strategist must keep his policy toward oil in a fluid and objective state which can be easily adapted to the ever-changing conditions of the world.

Moderate Increase in Imports Forecast in Ten-Company Survey

By Joseph B. Huttlinger

OIL importers plan to increase their inshipments of oil into the United States moderately during the first half of 1950. This program is revealed in a compilation of reports gathered by the House Small Business Committee and the State Department's petroleum division from ten oil companies.

"The combined estimates for the ten companies indicate a steady but moderate increase in imports of crude oil during the balance of 1949 and the first half of 1950," Willard Thorp, assistant Secretary of State for Economic Affairs, wrote in transmitting the data to Representative Ed Gossett (D., Tex.). The specific figures show a peak of 717,000 barrels daily of crude and refined products to be imported next February and 706,000 barrels daily as an average for the first quarter of next year. The figures represent 86 to 92 percent of the United States foreign trade in petroleum, the State Department pointed out. By extrapolation first-quarter 1950 total import figures would rise to an average of 776,000 barrels daily for all companies. A comparable computation for the third quarter of this year shows total imports to the United States standing at about 633,000 barrels daily. Figures gathered from the ten companies are shown in Table I.

The State Department defended current trends in imports by stating that the domestic oil industry is in a healthy condition and that the curtailment in production earlier this year has not primarily caused imports.

The department furnished Table II comparing crude oil production cutbacks at home with the flow of imports.

Table I

Total Crude and Refined Oils
(Thousands of Barrels Daily)

Period	Imports	Exports	Net Bal.*
1949-July	576	230	(346)
Aug.	522	307	(215)
Sept.	593	277	(316)
3rd Quarter	566	268	(298)
1949-Oct.	654	254	(400)
Nov.	688	240	(448)
Dec.	676	240	(436)
4th Quarter	674	244	(430)
1950-Jan.	704	228	(476)
Feb.	717	231	(486)
Mar.	700	234	(466)
1st Quarter	706	231	(475)
1950-Apr.	602	235	(367)
May	594	230	(364)
June	610	245	(365)
2nd Quarter	602	236	(366)

Table II

	1st half 1949 compared with 1st half 1948	1st half 1949 compared with 2nd half 1948	2nd Quar. 1949 compared with 4th Quar. 1948
Crude Production:			
U. S.	—285,000	—444,000	—702,000
Texas	—325,000	—407,000	—608,000
Petroleum Imports:			
Net	+109,000	+ 35,000	+ 1,000
Gross	+112,000	+ 57,000	— 21,000

In transmitting the survey results, Mr. Thorp said: "It is our conclusion that restrictions on the imports of petroleum are unnecessary and would be both unwise and detrimental to the interests of the petroleum industry of the United States.

*Parentheses indicate net import balances.

AEROCAT CATALYSTS...

provide high octane fuel for modern engines

Modern fluid cracking techniques are accomplishing refining operations today that only a few years ago would have been considered impossible. Cyanamid has contributed to this progress by the development of the remarkably efficient AEROCAT* Ground and Microspheroidal Synthetic Fluid Catalysts, now in expanded full scale production at Cyanamid's modern Fort Worth plant.

The experience, the skill, the extensive research and technical facilities that made these new products possible are at your service in the selection and use of the right catalyst to meet your specific requirements.

Other Cyanamid chemicals for the petroleum industry include AEROLUBE* Additives for regular, premium and heavy-duty motor oils . . . AERO** Specialty Catalysts for various chemical processes, Gasoline Dyes and Drilling Mud Chemicals. Literature and samples of these products are available upon request. Write today.

**Trademark *Reg. U. S. Pat. Off.

AMERICAN Cyanamid COMPANY
PETROLEUM CHEMICALS DEPARTMENT, DIV. B11
30 Rockefeller Plaza, New York 20, N. Y.

WHEN PERFORMANCE COUNTS . . . CALL ON CYANAMID

For further information in Europe, consult Cyanamid Products, Ltd., Bretteham House, Lancaster Place, London W. C. 2, England.

PRESENT CONDITIONS ENDANGER GROWTH OF AUTOMOTIVE TRANSPORTATION

By Alexander Fraser
President, Shell Union Oil Corporation

FOLLOWING the traffic-snarled Fourth of July weekend, an article in the New York Times contained this significant remark: "It was apparent that the motor vehicle was defeating its own purpose." Even the vaguest suggestion that the automobile is beginning to "defeat its own purpose" is enough to call for a searching analysis to determine whether the facts support any such conclusion. This is especially important for our industry because of its tremendous stake in the continued growth and vigor of automotive transportation. It is opportune, therefore, to examine some of the elements entering into the transportation picture to see how they may operate to restrict or retard the use of the motor vehicle in our national economy.

The primary and outstanding advantage of the automobile over all other forms of transportation is the freedom of movement which it provides for the individual. This freedom of movement, or mobility, is limited only by the personal tastes and pocketbook of the individual. The freedom of the individual to go where he pleases and when he pleases distinguishes this mode of transportation from other forms, practically all of which are subject to regulation and a scheduled timetable. It is this very freedom of movement of the automobile which is an important contributing cause of our present traffic problem.

From personal experience all of us are deeply conscious of the traffic problem which is facing the country today, but are we as fully aware of what its implications may be for our industry? Not alone is the problem confined to delays and annoyances engendered by traffic conditions, but it is contributing in no small measure to the ascending costs of automotive transportation. It thus becomes a matter of serious concern if the costs of car ownership and operation are beginning to curtail the use of the vehicle itself or to price potential owners out of the market. And so the question presented is whether mounting costs and snarled traffic conditions are beginning to slow down unnecessarily the growth curve of automotive transportation.

(Speaking before the National Petroleum Association at Atlantic City on September 14, Alexander Fraser directed attention to conditions tending to discourage the growth in the use of automotive transporation. Because the situation described presents a definite problem to the oil industry, the address is published herewith.)

It seems to me important to call attention to the fact that the several elements affecting automotive transportation fall into two distinct categories. In the first place there are those factors which are concerned directly with owning and operating a car; and in the second place we must examine the conditions or environment under which the car is operated.

At the turn of the century the price of the horseless carriage" averaged around fifteen hundred dollars, and the product was anything but comfortable or dependable. Thanks to the introduction of mass production and the assembly line, together with keen competition between manufacturers, the standard low-priced cars could be purchased ten years ago for about $800. It will also be recalled that Henry Ford's Model "T" reached the unbelievably low list price of $290 by 1925, which, by the way, did more than anything else to put America on wheels.

The standard low-priced car now costs the prospective purchaser nearly $1600, resulting in a depreciation charge about twice that of prewar. Of course, the car of today is far superior to its predecessors in reliability, comfort and performance. However, it may be pertinent to pose the question as to whether current prices may be tending to drive certain marginal buyers out of the market. In arriving at an answer to this important question, we must take into consideration the greater earning power of the consumer due to the inflationary processes of the past decade.

In ascertaining automotive transportation charges, we come next to the cost of motor fuel. Ever since the introduction of the automobile, there has been continuous improvement in gasoline quality as well as a steady lowering of price to the motorist. Notwithstanding the fact that the price has been increased about 50 percent compared with ten years ago, a gallon of gasoline exclusive of tax still costs only two-thirds of the price prevailing after World War I. Such a claim can be made for relatively few commodities in our national economy.

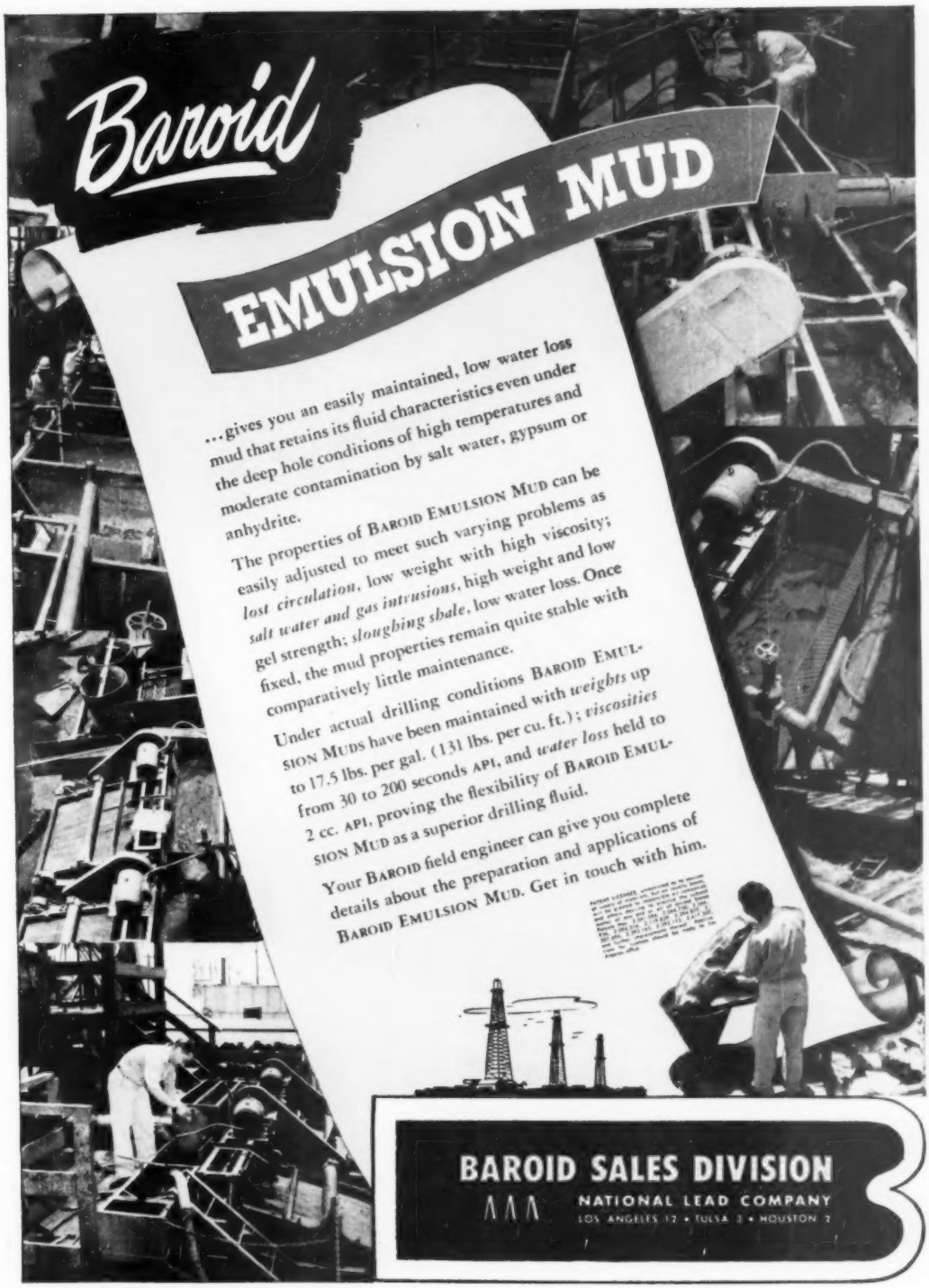
Not only the automotive and petroleum industries, but the rubber industry also has done an outstanding job. The research, technical and mechanical improvements which have entered into the manufacture of the pneumatic tire have produced a product which gives the motorist four times as much for his tire dollar as he obtained 20 years ago. As a matter of fact, the only similarity between the tire then and now is that they are both round. The price despite all the improvements is about the same.

These three principal industries, automotive, oil and rubber, inseparably linked together in the automotive transportation field, are excellent examples of the benefits to be derived from a highly competitive enterprise system. The ingenuity and imagination which have gone into the manufacture of these products and the keen, aggressive competition which has characterized their distribution are the best assurance to the consumer that he will continue to receive products of the highest quality at the lowest possible cost.

A growing factor in the operating budget of a motor vehicle is the cost of postwar insurance. Perhaps it would be more accurate to call this "the cost of accidents" rather than "the cost of insurance," for if the accident toll were reduced, insurance rates would decline also. In order to insure against liability for bodily injury and property damage in New York City, it is estimated that the average motorist must spend more than $100 per year. Assuming a mileage of 7000 per annum which is said to be about average for that area, the most of liability insurance would be on the order of 1½ cents per mile. This is approximately equivalent to the per mile cost of gasoline.

The cost of accidents, whether paid directly by the individual himself, or through climbing insurance rates, has a deterrent effect on the growth of car ownership throughout the nation. This high cost has led entirely too many families to feel that they can no longer afford automobile insurance.

An important factor contributing to the high rate of automotive insurance is the matter of law enforcement. The great need for improved


Baroid
EMULSION MUD
...gives you an easily maintained, low water loss mud that retains its fluid characteristics even under the deep hole conditions of high temperatures and moderate contamination by salt water, gypsum or anhydrite.
The properties of BAROID EMULSION MUD can be easily adjusted to meet such varying problems as *lost circulation*, low weight with high viscosity; *salt water and gas intrusions*, high weight and low gel strength; *sloughing shale*, low water loss. Once fixed, the mud properties remain quite stable with comparatively little maintenance.
Under actual drilling conditions BAROID EMULSION MUDS have been maintained with *weights* up to 17.5 lbs. per gal. (131 lbs. per cu. ft.); *viscosities* from 30 to 200 seconds API, and *water loss* held to 2 cc. API, proving the flexibility of BAROID EMULSION MUD as a superior drilling fluid.
Your BAROID field engineer can give you complete details about the preparation and applications of BAROID EMULSION MUD. Get in touch with him.
BAROID SALES DIVISION
NATIONAL LEAD COMPANY
LOS ANGELES 12 • TULSA 3 • HOUSTON 7

METAL CONTAINERS

For PETROL, OIL, BITUMEN, GREASE, POWDER, ASPHALT, CEMENT, Etc.

METAL CONTAINERS LTD., 17 WATERLOO PLACE, PALL MALL, LONDON

WORKS: ELLESMERE PORT & RENFREW ASSOCIATED COMPANIES OVERSEAS

law enforcement was proved by a National Safety Council survey covering twenty-four states in the year 1947 which showed that one or more drivers violated a traffic law in 72 percent of all fatal accidents. The record of pedestrians was even worse. A study of accidents and enforcement in any city or state over a long period shows a definite relation between the two. When enforcement is improved, accidents go down and vice versa. One of the most interesting recent case histories, and there are many, is that of the city of Los Angeles. In 1946 the city markedly increased its enforcement and educational efforts. Only two years later, the 1948 death toll for the city showed a reduction of 42 percent from the earlier year.

Much has been achieved in recent years to promote safer driving, but much still remains to be done. Not only is the unskilled or reckless driver a menace on the highway but his behavior adds untold millions to the nation's automotive costs.

Drivers must be educated, and in this connection the President's Highway Safety Conference last June turned the spotlight on the youth of the nation. It reported that teen age drivers have the highest accident rate of any age group. Their appalling accident record is something like five times greater than that of the drivers between 45 and 50 years of age. This fact is reflected in current insurance rates in most states, which are 30 to 35 percent higher for the ages below 25 than for other drivers. In New York State the rates for the young group have just been raised to a level 60 to 70 percent above the regular rates. This has set a pattern which other states are likely to follow.

But youth has potentially the best drivers. Proper training can make them so. Today more than 2500 high schools offer behind-the-wheel instruction to their students. Although that represents real progress, the number embraces only about ten percent of the nation's high schools.

Experience has proved the effectivenss of driver training in the schools. As a group, the students who have received driver education in high school have had only one-half as many accidents as those who did not receive this training. In this regard the President's Conference reported that: " . . . successful programs in driver education and training show that this single area of traffic safety education in the secondary school is unquestionably the most fertile territory for the motivation of desirable habits, skills and attitudes related to traffic." Therefore, it is clear that if the two million young people reaching driving age each year can be properly instructed, we will quickly raise the driving standards throughout the country.

The problem of parking has become a major phase of urban congestion. Parking in our crowded cities is expensive no matter how it is accomplished. The situation is nationwide, but it is most critical in the larger cities. In Philadelphia, the Traffic Engineer estimates that with the opening of business any morning in the center of that city, there is one chance in 100 of finding a parking space at the curb. By noon the chance has diminished to one in 1000. Moreover, it is said that 100,000 motorists compete for 20,000 spaces in parking lots and garages.

The New York problem has become progressively more acute. In 1946, 800,000 cars daily converged on midtown Manhattan—40,000 more than in 1940, and during that period parking space had decreased 30 percent! And no signs of improvement are on the horizon. Again I quote, this time from an editorial in the New York Times:

"It is easy to understand the concern felt by city officials over the prospective traffic 'chaos' bound to exist in already-congested lower Manhattan when the Brooklyn-Battery Tunnel opens in June, 1950. It is a nightmare to visualize the hordes of cars spewing out of the tunnel into local streets ill-equipped to handle it."

This is not the place to go into various solutions, for there are several, and in the final analysis, local characteristics and preferences must dictate. It is sufficient to say that off-street parking facilities must be provided. Whether these facilities are provided by private enterprise, which many believe should be the case, or by government, there remains in every case the public responsibility to see that adequate parking is available, for the parking problem is an integral part of the larger problem of urban transportation and planning.

With the end of the first World War came the first tax on gasoline. This was imposed by the state of Oregon in 1919, and it was one cent per gallon. With the rapidity of an epidemic the imposition of a tax on gasoline spread to every state in the Union and to many political subdivisions of the states, and to the Federal Government itself. State gasoline taxes now average more than five cents per gallon throughout the nation, and the federal tax is 1½ cents additional. The total tax revenue to the state, federal and local governments in 1948 was nearly $2 billion from this source alone.

The oil industry has no quarrel with the principle of a tax on gasoline, provided the rates are reasonable and the proceeds are dedicated to the construction, maintenance and improvement of streets and highways; but it does stoutly oppose, and will continue to oppose, the diversion and dispersion of such tax revenues. Concurrently, the industry will continue to advocate the better administration of such funds, the introduction of sound financial policies, and the elimination of waste and duplication. The construction of roads and highways dictated by political expediency, rather than by the scientific determination of traffic needs, is a waste of public funds and adds its toll to the mounting cost of highway transportation.

Having dealt with the more obvious factors which enter into the automotive picture, let us now direct our attention to certain root causes of the situation confronting us today. The direct cost is easily ascertainable; the hidden cost is often elusive and difficult of assessment. It is my opinion that the most insidious invisible contribution to today's soaring operating cost is the high price of congestion on our streets and highways.

A number of surveys have been conducted to determine the difference in a car's gasoline consumption between express and congested highways along parallel routes. The findings are most significant. Gasoline consumption runs all the way up to 100 percent greater on congested routes of travel compared with the clear and open highway. It may be inferred that this is an excellent state of affairs for the oil industry; the more congestion, the greater the gasoline consumption! But I am sure that this is a shortsighted point of view.

A striking illustration of how congestion influences the cost of transportation, and hence the cost of commodities, is provided by the California Public Utilities Commission in its method of rate determination for commercial trucks. It is based upon mileage, which then is adjusted for congestion as measured by direct observation. For example, the distance between Los Angeles and Santa Monica is 16.5 miles, but in setting truck rates in 1937 this was calculated as 17.5 miles, because of the congestion factor. By last year, it was found that the increased congestion on the same route made truck operating costs equivalent to those on a 19.5 mile trip. Consequently, authorization for an 18 percent increase was granted to compensate for the greater degree of congestion!

Congestion has an emotional effect on the car owner which probably is as serious as its economic effect. Sunday travel in the vicinity of large cities throughout the country is becoming symbolic of annoyance, delay and inconvenience. The creeping, bumper-to-bumper progress, with its inevitable stopping and starting, gear shifting, overheating and stalling, is driving motorists off the highways. Fewer and fewer people are driving for sheer pleasure, as they once did. In planning the weekend trip more and more consideration is being given to when and how best to avoid the traffic snarl, and after a few exasperating experiences it is many times decided to stay at home and abandon the trip altogether. This represents lost mileage, and lost mileage means less gasoline consumed.

A syndicated columnist writing from Washington recently said:

"So, here is the U. S., its auto industry striving to break all production records, its plant capacity geared to an every-family-a-car postwar ambition, and its motor vehicle population at a new high. But its road system is strictly prewar. Highways are narrow and in poor repair; city streets are choked, traffic moves at a snail's pace in rush hours, and one-way streets, hardly an adequate solution, are on the increase. As for parking, try. Here, then is the bottleneck of tomorrow: * * * not whether people can afford to buy cars;

not whether the industry can produce; but whether a private automobile will have decreasing economic utility."

The extent to which these conditions are decreasing the economic utility of passenger cars is unknown. There have been some indications lately that the curve of average annual mileage per passenger car has been leveling off after a steady upward trend for over a quarter of a century. To be sure, it may be reasonably assumed that this phenomenon is the natural result of expansion of the car population since the war. On the other hand, if there is even a suspicion that it stems from present driving conditions, then it is time to start doing something about it.

What has happened is that the development of the highways of the country, and of traffic engineering in the urban areas, has not kept pace with the growth in the number of motor vehicles and the expansion of their use. Since the early twenties motor vehicle registration has increased more than threefold. During this same period gasoline consumption has leapt forward at a much greater rate, in fact a fivefold increase, which represents greatly expanded individual vehicle use.

Yet, while this was taking place, highway construction woefully lagged behind; and traffic conditions in urban areas steadily deteriorated. Measured in dollars, the volume of construction reached a peak in 1930 of one billion and a half and then fell sharply off for 16 years, with the low point recorded in the war year of 1944. Not until last year did construction volume reach the 1930 level; but there were only 26.5 million motor vehicles in service in 1930 as compared with 41 million in 1948. The road program of the nation has been seriously hampered for almost a generation by the most severe depression in our history, followed by World War II with its restrictions on road construction, and, until quite recently, by shortages of equipment, manpower and materials.

No wonder we are today suffering from congestion paralysis! It is a challenge which calls for vigorous action by federal, state, county and municipal governments.

One suggested course of action is to create a highway survey committee in each state, responsible to the legislature and representing state, county and urban interests, as well as the highway user groups. Such a committee would be charged with responsibility, first, of seeing that the engineering, administrative and financial phases of the survey are developed concurrently and with proper coordination; and second, of studying the findings of the technical consultants and formulating final recommendations for legislative action.

Unless the problem is tackled on the basis of long-range planning, then we shall be denied the full benefits of the current and future vast expenditures for road construction, maintenance and improvements. Not to receive the full benefit of such expenditures simply means higher operating costs and lower standards of service.

I venture to urge that the oil industry contribute its best efforts towards reducing the costs of automotive transportation, by doing all it can to improve the flow and safety of traffic on our highways and city streets. As a start, such a program would envisage:

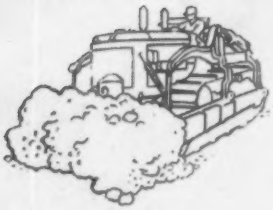
(1) To support public officials in the strict enforcement of all laws and regulations controlling traffic and to encourage employees and the public to do likewise.

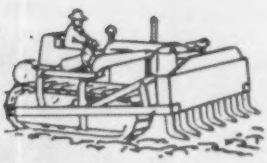
(2) To support behind-the-wheel instruction to all high school students as being the most fertile area for inculcating good habits, skills and attitudes relating to traffic.

(3) To support long-range comprehensive highway planning, combined with sound administrative practices and realistic fiscal policies.

The prevailing situation is one which threatens to decelerate the future growth and prosperity of our Industry. Let us mobilize ourselves and our communities to work out solutions to correct the present state of affairs. Let us do it now. It may be later than we think.

Here is the Allied Equipment matched to INTERNATIONAL INDUSTRIAL POWER





BUCYRUS-ERIE TRACTOR EQUIPMENT

ISAACSON LANDCLEARING AND EARTHMOVING EQUIPMENT

HEIL EARTHMOVING EQUIPMENT

SUPERIOR SIDEBOOMS AND ANGLE-FILLERS

HUGHES-KEENAN TRACTOR CRANES

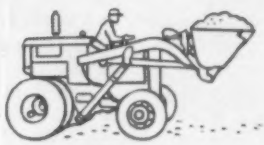
M-R-S DIESEL WHEEL TRACTORS AND MISSISSIPPI WAGONS

HOUGH PAYLOADERS

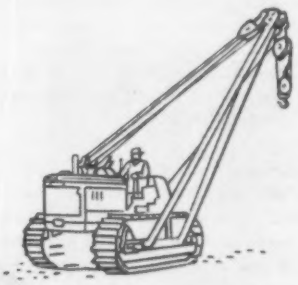
TROJAN ROAD MAINTAINERS

BROOKVILLE LOCOMOTIVES

READY-POWER ENGINE GENERATORS



For sales and service on the matched and allied equipment listed here—as well as on International Crawler and Wheel Tractors and International Power Units—depend on the *one complete source* available to you in any of 65 countries where International Harvester affiliates and distributors are identified as headquarters for . . .



INTERNATIONAL INDUSTRIAL POWER

INTERNATIONAL HARVESTER EXPORT COMPANY

180 NORTH MICHIGAN AVENUE · CHICAGO 1, U. S. A.

CHEMICALS FROM PETROLEUM

By Dr. O. W. Willcox

Although Recognized as a Source of Basic Chemicals for 25 Years the Petrochemical Industry Has Made Its Greatest Strides in the Past Decade

CRUDE petroleum came to be recognized about a quarter of a century ago as a rich source of basic materials for the organic chemical industry, which theretofore had been dependent on coal tar and various agricultural products. With the increase of population and a succession of wars, the demand for organic chemicals was increased beyond the supply of raw materials for this industry, and the prices of organic chemicals naturally showed a strong tendency to rise.

The consequence was that chemists began to take note of the fact that crude petroleum could supply a base for nearly every product that the organic chemical industry might wish to manufacture, at a lower price and, more importantly, in greater volume than could be obtained from the coal mines and the farms.

The progress of research in petroleum chemistry, and more particularly the appearance of a demand that other sources were not meeting, led to installation of the first petrochemical plant by the Cities Service Oil Company at Tallant, Oklahoma, for oxidizing the so-called "permanent" petroleum gases—methane and ethane—to produce methanol, formaldehyde and acetaldehyde. Several years later Esso Standard Oil Co. and General Motors began to manufacture the two petrochemicals, ethyl chloride and ethylene bromide, which are basic materials for tetraethyl lead, which has developed into a large enterprise. In succeeding years the Carbide and Carbon Chemicals Corp., the Dow Chemical Co. and Shell Chemical Co. entered the field with plants on the Gulf Coast for the manufacture of lines of commoner organic chemicals.

It is reported that up to 1940 a total of about $70,000,000 had been invested in facilities for the manufacture of organic chemicals from petroleum, mostly in the southwest. Then came World War II and with it an enormous demand for certain organic chemicals. Most of the new demand was for explosives and synthetic rubber. After the war a number of projects were initiated, and now petrochemical factories costing well over $1,000,000,000 have been built or are building in the United States. At about the time the Cities Service Oil Company started its Tallant enterprise in 1926, the total production of what could be called raw petrochemical materials did not exceed 150,000 pounds a year; in 1948 more than three billion pounds of such materials were produced. Authorities who are studying the subject predict that, considering existing trends in demand and the limited ability of the coal mines and farms to meet the situation, there is now room for expanded facilities that will cost up to another quarter-billion dollars.

The petrochemical industry has a structure and some characteristics which it is well to have in mind. In the first place, while this more-than-a-billion-dollar industry is big enough to impress the man in the street, it is relatively insignificant from the standpoint of the petroleum industry as a whole. According to Egloff, the relatively huge quantity of petroleum materials for organic chemicals now being turned out represents less than 0.5 percent of the annual production of crude petroleum in this country. It is also estimated that less than 10 percent of the 5.6 trillion cubic feet of natural gas produced annually is used for making organic chemicals, including carbon black. Considering these proportions, it is evident that the petrochemical industry is limited only by the demand for organic chemicals and not by the supply of its raw materials.

A peculiarity of the petrochemical industry is that its chief promoters are not the oil companies themselves but companies which are chemical manufacturers. According to a survey made by Bland*, less than a third of the total petrochemical investments is in the hands of oil companies. Of the six largest operators, only one (Shell Chemical Co.) is wholly owned by an oil company; four (Carbide and Carbon Chemicals Co., Celanese Corp. of America, Dow Chemical Co. and Du Pont,) are purely and simply chemical concerns; the sixth big one is Ethyl Corp. which is jointly owned by Standard Oil Company (N.J.) and General Motors.

On the whole, of 18 firms active in the business, only six (including two ammonia enterprises for fertilizer manufacture) are entirely owned by oil companies, and two are half-owned by oil companies. Considering only petrochemical plants in the southwest, Bland estimates that petroleum company investments in petrochemicals total $128,000,000, while chemical company investments amount to $262,600,000. The largest single interest is Du Pont ($78,500,000) which requires petroleum products—methane from natural gas, ethylene and cyclohexane—for producing methanol, polythene and materials for nylon. Du Pont is followed by Shell Chemical Co. ($54,000,000); Dow Chemical ($35,000,000); Carbide and Carbon ($32,000,000); Celanese Corp. ($25,000,000), and Commercial Solvents Co. ($22,000,000).

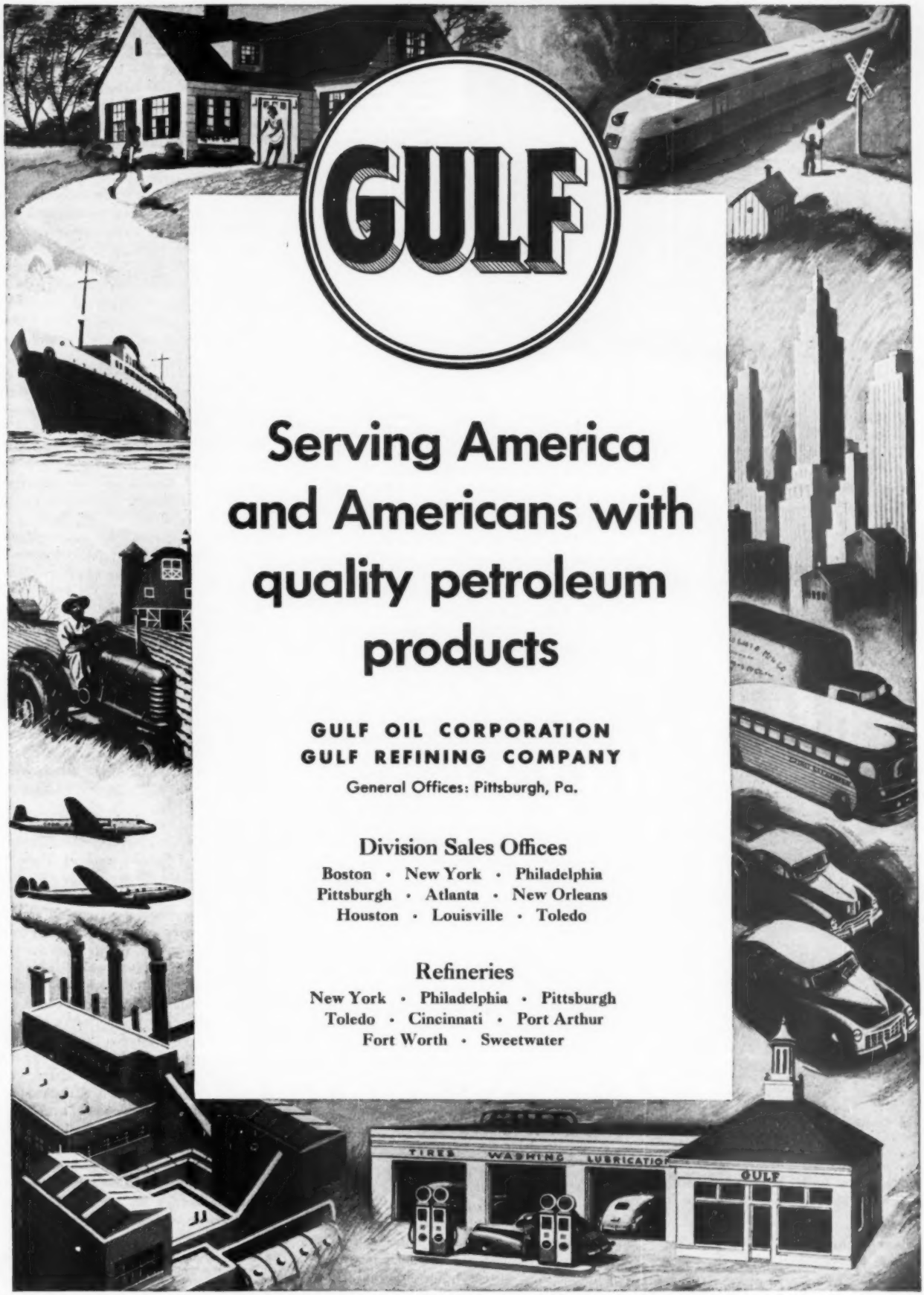
A special position is occupied by Carthage Hydrocol, Inc., which is building a $38 million enterprise at Brownsville, Texas, for the manufacture of synthetic gasoline from natural gas by the Fischer-Tropsch process, in which large quantities of oxidized hydrocarbon compounds will be obtained as by-products.

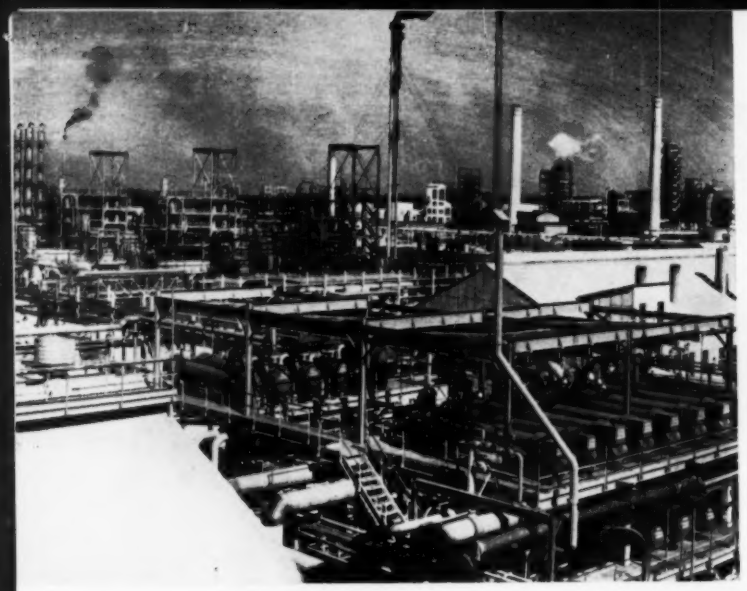
Location of plants processing natural gas may be at any convenient point along the great pipelines which span the continent, but those processing natural gas liquids, such as ethane, propane and butanes are normally built close to supply points to reduce transportation costs. This is the case of the Monsanto Chemical Company's plant at Texas City where styrene, one of the components of synthetic rubber, is manufactured.

Among the most valuable of the raw materials for petrochemicals are the olefin hydrocarbons. These are not found in natural crude oil but are abundantly formed in cracking processes by which gasoline is produced in oil refineries. Plants making petrochemicals from olefins must be operated in close connection with a refinery which will supply them, by pipeline, with cracked refinery gases. This is the case of the Diamond Alkali Co. of Houston and the Jefferson Chemical Co. of Port Neches, Texas, which use ethylene as their base material.

However, the oil refiner can very well polymerize his olefins and thereby increase his output of high-grade gasoline, and if he cedes them to a chemical manufacturer, he will price them according to their alternate worth. If an oil refiner goes into the petrochemical business, it will be mostly on account of his possession of a large olefin supply which he can divert to his petrochemical works in larger or smaller proportions according to the status of the gasoline or chemicals market. Some persons have expressed wonder at the fact that the big oil companies, which have first-hand possession of all kinds of petroleum material—natural gas, LPG, cracked refinery gases, etc.—and are well supplied with chemical talent, are not moving to take over the whole organic chemical industry from the chemical companies. It has been estimated that the organic chemical industry is now 30 percent based on petroleum materials; why not the remaining 70 percent? The answer may be that, to the refiners, petrochemicals are a small matter from the volume standpoint. Their production requires large plant investments which are not without some risk. If a few more plants like Carthage Hydrocol come to be established for manufacturing gasoline from natural gas by the Synthine process, producing large quantities of petrochemical by-

* Petroleum Processing, April, 1949.


GULF
Serving America and Americans with quality petroleum products
GULF OIL CORPORATION
GULF REFINING COMPANY
General Offices: Pittsburgh, Pa.
Division Sales Offices
Boston • New York • Philadelphia
Pittsburgh • Atlanta • New Orleans
Houston • Louisville • Toledo
Refineries
New York • Philadelphia • Pittsburgh
Toledo • Cincinnati • Port Arthur
Fort Worth • Sweetwater
TIRES
WASHING
LUBRICATION
GULF



Synthetic rubber produced from petroleum was an important factor in World War II when natural rubber sources were lost to Allied governments. Pictured here is the first Butyl rubber plant built at Baton Rouge, La., by the Standard Oil Co. (N. J.).

products, the organic chemicals market could become oversaturated, and some financial shirts might be lost.

According to recent information the principal existing petrochemical plants in the United States are listed in Table I.

Table I

Company	Location	Raw Materials
Carbide & Carbon Chemicals Corp.	Texas City, Tex. Whiting, Ind. Charleston, W. Va.	Refinery gases and propane
Carthage Hydrocol, Inc.	Brownsville, Tex.	Natural gas
Celanese Corp. of America	Bishop, Tex.	Propane and butane
Diamond Alkali Co.	Houston, Tex.	Ethylene
Dow Chem. Co.	Freeport and Velasco, Tex.	Natural gas & cracked gases
E. I. DuPont de Nemours & Co.	Orange and Laporte, Tex.	Natural gas, refinery gas, cyclohexane
Floz-On Mfg. Co.	Houston, Tex.	Natural gas
Jefferson Chem. Co.	Port Neches, Tex.	Refinery gas
McCarthy Chemical Co.	Winnie, Tex.	Natural gas
Monsanto Chemical Co.	Texas City, Tex.	Refinery gas, propane
Phillips Chemical Co.	Etter and Houston, Tex.	Natural gas
Rohm & Haas Co.	Houston, Tex.	Natural gas
San Jacinto Ammonia Works (operated by U.S. Gov't)	Houston, Tex.	Natural gas
Shell Chem. Co.	Houston, Tex.	Cracked refinery gas
Commercial Solvents Co.	Sterlington, La.	Natural gas
Esso Standard Oil Co.	Baton Rouge, La.	Refinery gas
Ethyl Corp.	Baton Rouge, La.	Refinery gas
Mathiesen Chemical Corp.	Lake Charles, La.	Natural gas
Cities Service Oil Co.	Tallant, Okla.	Natural gas
Lion Oil Co.	El Dorado, Ark.	Natural gas
Spencer Chem. Co.	Pittsburg, Kan.	Natural gas

Other concerns that are known to be producing specialties in petrochemicals of one kind or another are Meri-Chem Co. of Houston (cresylic acid derivatives); the chemical division of Koppers (isopropyl alcohol); Tennessee Eastman (hexanol derivatives); Oronite Co. (oxidation products); Calco Printers and Imperial Petroleum Chemical Industries (terylene, a base for improved nylon and rayons); Stanton Chemicals Inc. of Corpus Christi, Texas. The last named is said to be the first concern to devote a refinery mostly to petrochemicals from crude oil. Only certain portions of the charge stocks are devoted to conventional refinery products of higher value. It has been stated that some 50 refineries in the United States are turning out small-scale quantities of various petrochemical specialties. Detailed data on this production are not available.

Some materials that may be classed as petrochemicals are obtained from certain natural crude oils without any special processing. These include naphthenic acids which are useful in making soaps, paint driers and fungicides; cresols for preserving wood and as raw materials for resin products; hydrogen sulfide for the manufacture of sulfur and sulfuric acid. Some natural gas wells furnish considerable quantities of carbon dioxide, in some cases enough to warrant installation of a special plant for the manufacture of dry ice. Other gas wells furnish important quantities of the non-combustible gas, helium, for non-rigid aircraft and for medicinal purposes.

As stated above, the principal raw materials for petrochemicals are natural gas, the light hydrocarbons in LPG and the cyclohexanes found in naphthene-base crudes. The methods of converting these materials into petrochemicals include all the processes with which organic chemists are familiar. Chief among these operations are oxidation, halogenation, sulfonation and nitration. Mostly, a petrochemical is an oxidation product, such as the various kinds of alcohols (methanol, ethanol, propanol, etc.), aldehydes, such as formaldehyde and acetaldehyde; organic acids like acetic acid; ketones like acetone and methylethyl ketone, which have wide use. In some plants that make these oxidation products, air is used for the oxidation; others have built large installations for liquefying air so as to obtain pure oxygen on a tonnage basis. Among the most important oxidation products is methanol (formerly called wood alcohol); more than a billion pounds of this important material is annually used in the United States; 70 percent of it is made from natural gas. More important still is ethyl alcohol; 70 percent of all the 160 million gallons of ethyl alcohol produced in the United States in 1948 was made from petroleum and only 30 percent by the fermentation of grain, molasses and other farm products.

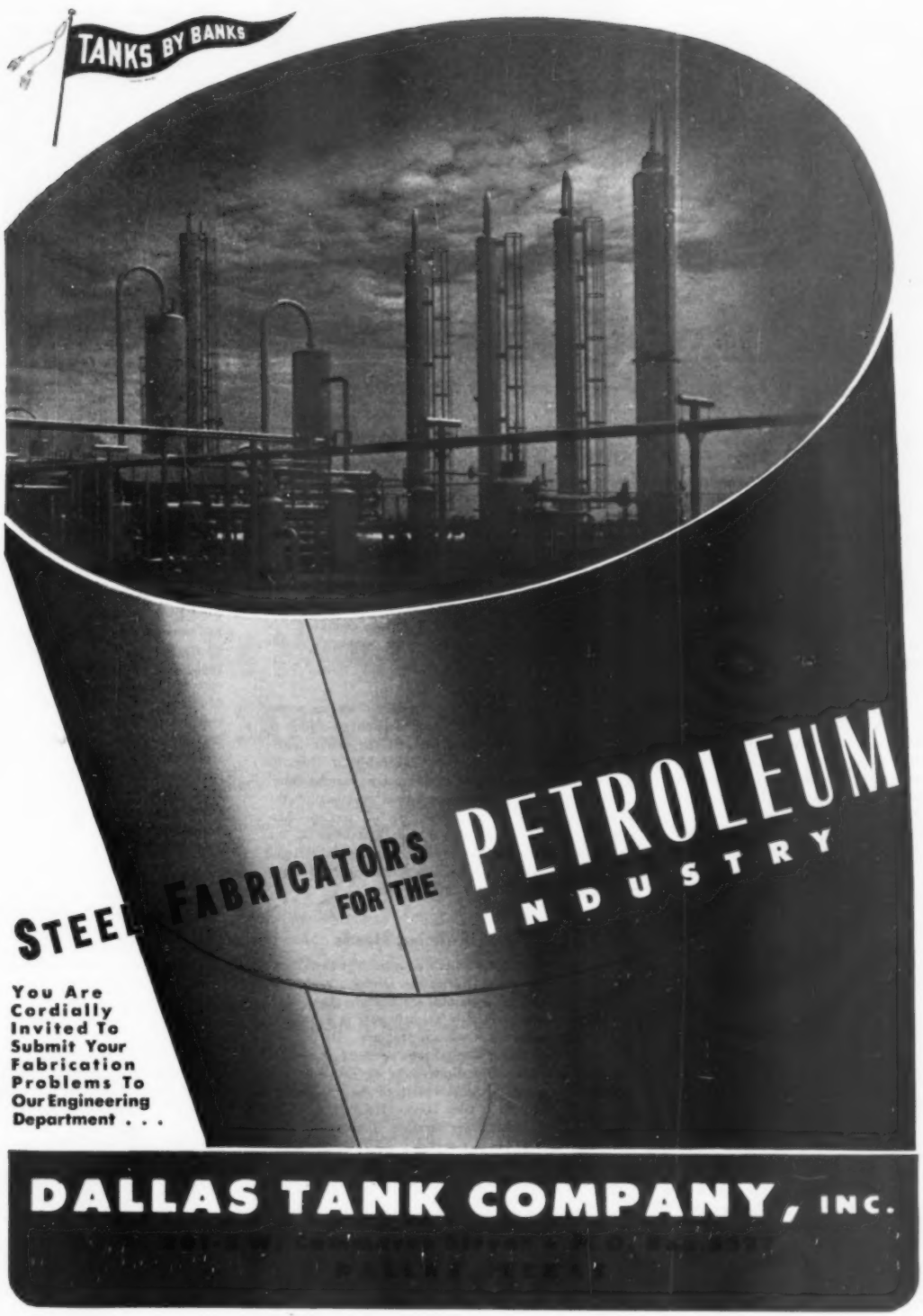
Ethyl alcohol is made synthetically from ethylene, isopropyl alcohol from propylene, both of which are obtained from cracked refinery gases. The higher alcohols with up to nine carbon atoms are made from olefins separated from cracked gasolines. This is an instance where the heavier liquid hydrocarbons are turned into petrochemicals. There is a growing use for these higher alcohols in the expanding plastics industry.

A very important petrochemical is glycerol (glycerine) which is producible from the propylene that is separated from cracked refinery gas. Production of glycerine from propylene has already attained about 35 million pounds a year. From the standpoint of conservation of food resources, this is important because for every pound of glycerine produced from petroleum, there is saved a pound of fat for food. In the manufacture of synthetic glycerine a number of other important petrochemicals are obtained as byproducts.

As in all other industries, the petrochemical industry is trying to supply the goods for which there is the largest demand. At the moment the oxidation products derived from the lower members of the hydrocarbon series are in great demand. These bulk products of petrochemistry include the aldehydes (principally formaldehyde); the simple alcohols (methyl, ethyl, propyl, butyl and amyl), of which mention has been made above; the polyalcohols, of which the trialcohol glycerine is one, and ethylene glycol, which is a dialcohol.

Besides these bulk items among the oxidized petroleum products, there are many others which are called for in smaller amounts. These include the organic acids for the textile and other industries and the ketones, which are of much importance as commercial solvents in such operations as fat extraction and many other purposes. The oil industry itself uses large quantities of methyl ethyl ketone for the refining of lubricating oils. The oil industry also uses considerable amounts of oxidized petroleum products as additives or improvers of its lubricating oils. A large item among the oxidation products is phthalic anhydride, which is produced by oxidation of the orthoxylene that is formed in catalytic cracking or hydroforming processes. Phthalic anhydride finds a wide use in the manufacture of alkyd resins and plasticizers for many industrial products. The annual production of phthalic anhydride is about 150 million pounds, mostly derived from coal tar naphthalene; the petrochemical phthalic anhydride has already bitten into this production up to 8,000,000 pounds a year.

A second article by Dr. Willcox on the development of the Petrochemical industry will be published in the December issue of WORLD PETROLEUM. Editor.


TANKS BY BANKS
STEEL FABRICATORS FOR THE PETROLEUM INDUSTRY
You Are Cordially Invited To Submit Your Fabrication Problems To Our Engineering Department . . .
DALLAS TANK COMPANY, INC.

International News and Notes

J. V. Canessa

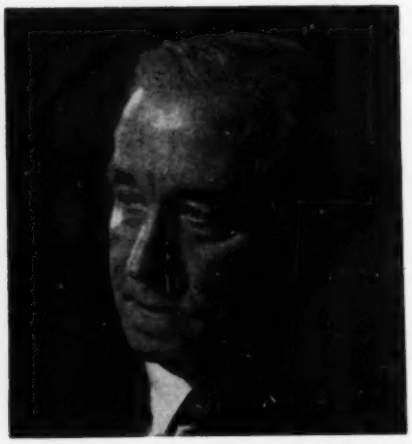
Argentine Gas Line Complete

The inaugural ceremonies of the new transmission artery, one of the most important achievements of President Peron's "Plan of Government," will take place in December. The "spinal column of the nation's energy," as President Peron so opportunely calls it, was constructed at a cost of approximately $35,000,000 and will have an initial daily capacity of 35,300,000 cubic feet. This is considered sufficient to supply the domestic and industrial needs of the communities along the route of the line and the greater Buenos Aires area. Later as production increases, the fuel will be made available to the industries along the Atlantic Coast and the Buenos Aires area.

Completion of the project is an example of perseverance on the part of J. V. Canessa, general director of the Argentine Government Gas Service Department, to carry on in the face of material shortages and other handicaps. After unsuccessful attempts to obtain from the United States and other countries enough pipe for the line, a factory at Dalmine, Italy, which was saved from the ravages of war, was able to supply it.

Construction of the line presented a diversity of problems. Numerous drainage canals and small streams and rivers were crossed. In addition to rainy, and at times, extremely cold weather, construction crews were confronted with hilly, rocky and swampy terrain.

Although the utilization of the natural gas reserves in Argentina has been the subject of study for many years, the pipeline project was planned a few years ago when Eng. Canessa was placed in charge of the project. This necessitated detailed planning and engineering skill in all its technical aspects. Argentine labor was employed both in the skilled and semi-skilled work. Mr. Canessa is a native of Argentina and was recently appointed president of the Argentine Government Oil Fields (YPF). He obtained the degree of industrial engineer at the University of Buenos Aires in 1925. In 1927 he was engaged by the Argentine Government Oil Fields as chief of the gas plant and chief of operations of the La Plata refinery. In 1938 he was appointed administrator of the San Lorenzo refinery. In 1931, 1936 and 1940 he went to the United States to study the gas and petroleum industry there and to acquire equipment. In 1945 he was appointed director general of the Argentine Government gas service department and in April 1949, president of the YPF. He still retains the position as director general to the gas service department. He is also a member of the faculty of the Buenos Aires University.



Holland Young Blades

Wakefield Director to Retire

After over half a century's connection with the oil industry, the retirement is announced of Holland Young Blades, one of the three joint managing directors of C. C. Wakefield & Co. Ltd. He was one of the eight men who joined Viscount Charles Wakefield when he founded in 1900 the company which bears his name. Throughout his whole career he has been connected with the production side of the business. In 1910 he was appointed manager of the purchasing department, and at the outbreak of the 1914 war he combined this position with that of manager of the company's northern works.

From 1920 onwards Mr. Blades played an important part in developing the company's output facilities to meet the greatly expanded demand for motor lubricants. Elected a director of Wakefields in 1938, he became joint managing director a few months later. During the last war he served as member of the Petroleum Board's Pool lubricating oil section. Mr. Blades actually relinquishes his present office at the end of the year but is to continue as an ordinary director of the company, and his wide knowledge and counsel will still be available to the board.

Australia's Refining Needs

In a review of the Australian petroleum industry, recently prepared by the Australian Division of Industrial Development, it is pointed out that the Australian refining industry plays only a small part in supplying local requirements of petroleum products. Its five refineries produce about 649,000 tons per year or 16 percent of total demand, estimated to be just short of 4,000,000 tons. With the exception of the small plant for treating shale oil at Glen Davis (N.S.W.), all Australian refinery plants are straight distillation units and do not include modern cracking units. Consequently they are not capable of producing all the various types of petroleum products in the proportions required for the market.

A consequence of this would be, states the review, that if oil were discovered in Paupua-New Guinea, it would be most unlikely that present Australian refineries would be able to make proper use of it. The review considers there is a strong case for the installation as soon as possible of a complete modern refinery combining distillation and cracking facilities and equipped to produce all types of commercial petroleum products. To be of economic size, such plant would need a capacity of 500,000 tons annually and would cost in the region of $19,200,000.

Drilling Begun In Mexico

The Mexican American Independent Co., operating unit for American Independent Oil Co. de Mexico, S.A., Signal Oil & Gas Co. de Mexico, S.A., and Edwin W. Pauley, began drilling its first well on Oct. 13 for Petroleos-Mexicanos (Pemex). Drilling is under exploration and development contracts signed last March. All operations of the contractors are in charge of Bart W. Gillespie, general manager, with general offices in Mexico City. Field headquarters have been established at Coatzacoalcos to supervise the drilling of the first well.

The first well, known as Tortuguero No. 1, is located just east of Coatzacoalcos in the State of Veracruz. While the actual well site will be on the beach, drilling will be directed out under the waters of the Gulf. Selection of Tortuguero No. 1 as the site for the first well was the result of geological and geophysical work undertaken earlier this year. Completion of the test is expected in six to eight weeks, if drilling proceeds normally.

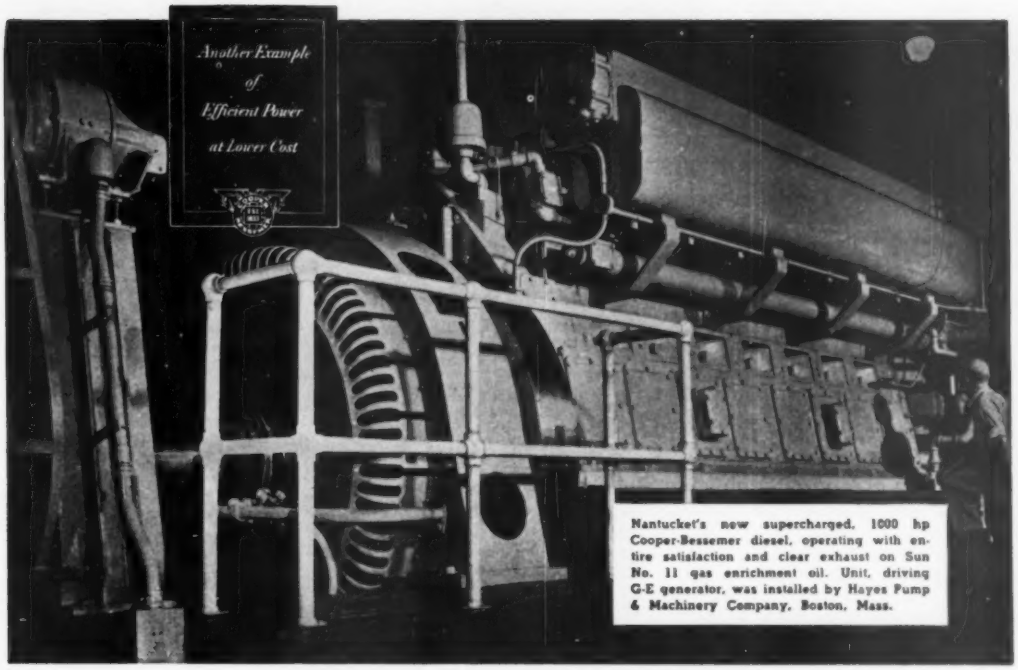
Supervises Canadian Crews

S. A. White, Independent Exploration Co. party chief, has been assigned to supervise seismograph crews operating in Alberta, Canada. Mr. White has been associated with I.X. for 16 years and for the past year and a half has been conducting surveys in Wyoming and Montana.

J. P. JURRIUS, hitherto first assistant chief engineer for CPIM, one of the Royal Dutch Shell subsidiaries, and among the world's largest oil refineries, located on the isle of Curacao, N.W.I., off the coast of Venezuela, has been promoted to chief engineer. Having entered the service of the Bataafsche Petroleum Maatschappij at The Hague on Jan. 1, 1921, he was sent out to Mexico where he worked in the engineering and pipeline department until November 1925, at which time he transferred to the Maracaibo resident engineer section. He remained there until October 18, 1935, filling among other jobs the position of head construction, testing and design section and efficiency department.

With the exception of a brief period from December 1946 until August 1947 at Cardon, Venezuela, where he was in charge of construction of the refinery then being erected, all of Mr. Jurrius's service since 1935 has been at Curacao, as chief maintenance engineer and subsequently as first assistant to the chief engineer.

J. P. Jurrius



Nantucket's new supercharged, 1000 hp Cooper-Bessemer diesel, operating with entire satisfaction and clear exhaust on Sun No. 11 gas enrichment oil. Unit, driving G-E generator, was installed by Hayes Pump & Machinery Company, Boston, Mass.

Nantucket's New Diesel Burns Heavy Fuel

SAVES $11,950 A YEAR!

NANTUCKET Gas & Electric Company urgently needed additional power capacity. Their aging steam turbine plant was hardly adequate. After carefully weighing all factors, a supercharged Cooper-Bessemer diesel was picked for the job!

For one thing, due to existing fuel storage facilities and the island's transportation problems, it would be a tremendous advantage to fuel the diesel with the same, low-cost heavy oil burned in the turbine boiler and used as an enriching agent in gas-making. Cooper-Bessemers had already demonstrated their ability to operate efficiently, reliably on Bunker C and other heavy oils.

Secondly, extremely close speed regulation was essential. The new unit was to be paralleled with the turbine generators and was to power an aircraft radio beam requiring exceptional cyclic control. Here again Cooper-Bessemers offered proved performance.

These and other problems in this unusual installation, *including the elimination of smoke*, despite the heavy fuel, were overcome right from the start. Consequently, the new engine went into service at once. And, by burning heavy fuel instead of regular diesel fuel, it is estimated that the new Cooper-Bessemer will save $11,950 a year at present fuel rates.

Whether your power need is ordinary or unusual, if you want to know how you can cut your power costs year in, year out, check with Cooper-Bessemer.

The Cooper-Bessemer Corporation

MOUNT VERNON, OHIO — GROVE CITY, PENNA.

New York City Washington, D. C. Bradford, Pa. Parkersburg, W. Va. San Francisco, Calif. Houston, Dallas, Greggton, Pampa and Odessa, Texas Seattle, Wash. Tulsa, Okla. Shreveport, La. St. Louis, Mo. Los Angeles, Calif. Caracas, Venezuela Gloucester, Mass. Colmes Engineering Co., New Orleans, La.

OIL COMPANY STAFF CHANGES

Earl C. Smith

Earl Smith Joins Brown & Root

Earl C. Smith has joined the staff of Brown & Root Inc. as sales engineer. He comes to Houston from New York where for several years he was job and design engineer for The Lummus Co. He has had wide experience with the oil and chemical industry as designer and consultant for a long list of plants over the nation. During the war he was a captain in the Chemical Warfare Division.

In 1939 he was called in by the Republic Oil Refining Co. at Texas City as a consultant and is credited with increasing gasoline production in that refinery by 23 percent through design changes. His past experience also includes service as engineer with The M. W. Kellogg Co., New York, where he did the engineering on structural changes in refinery designs; as sales engineer with Gulf Oil Corp. in New York; test engineer with the Maritime Petroleum Corp. of New York and the Richfield Oil Corp. of New York; assistant superintendent and engineer with the Anderson-Prichard Oil Corp. in Oklahoma City; operating engineer with the Shell Oil Co. Inc., Arkansas City, Kansas; and assistant superintendent and engineer with Ashland Oil and Refining Co., Ashland, Ky.

WILLIAM H. BEEKHUIS has been elected a vice president of the Standard Oil Co. of California. An economic counselor and formerly assistant comptroller of the company, Mr. Beekhuis has acted as secretary of Standard's executive committee for the past six months.

William H. Beekhuis

Lloyd K. Wells

Rejoins Graver Construction

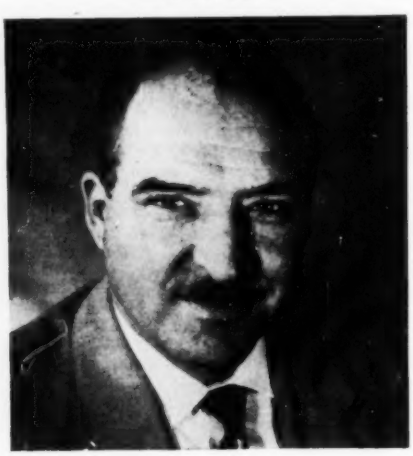
Graver Tank & Mfg. Co., Inc., East Chicago, Ind., has announced the return of Lloyd K. Wells to the company as manager of the southern division of Graver Construction Co. with headquarters at Houston, Texas. Mr. Wells left Graver in 1946 because of ill health and since that time has been engaged in citrus raising in California. From 1940 until 1946, Mr. Wells was manager of the Construction Division of Graver Tank & Mfg. Co., Inc. This division later became the Graver Construction Co.

LESTER L. LOGUE has been elected vice president and secretary of Exploration Surveys Inc., Dallas, Texas. He was one of the co-founders of the company, having started with the concern at the date of its inception as secretary-treasurer. Prior to the war Mr. Logue was employed as a paleontologist and a subsurface geologist by Creole Petroleum Corp.

Gottwald Promoted by Nordstrom

A. J. Kerr, vice president of sales for Nordstrom valve division, Rockwell Manufacturing Co., has announced the appointment of H. "Red" Gottwald as assistant sales manager. Mr. Gottwald has been identified with the company's valve operations since 1928 and has a wide experience both in domestic and foreign fields. For the past several years he has concentrated on South American accounts and handled the major part of Rockwell's export operations there. Mr. Gottwald will make his headquarters in Pittsburgh.

H. Gottwald



Left to Right: H. W. Brown, R. C. Clark, R. F. Weichert

H. W. BROWN has been appointed assistant chief geophysicist of The Carter Oil Co. Until recently he has served as supervisor of foreign geophysical operations.

R. F. Weichert, formerly on loan to the Imperial Oil Co. Ltd. from the Standard Oil Co. (N. J.), will assume the position of supervisor of foreign geophysical operations.

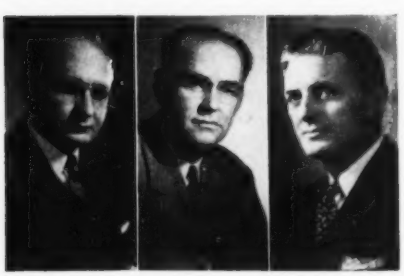
R. C. Clark, who has recently served as supervisor of geophysical operations in Carter's Northwest Division, will become Assistant Supervisor of foreign operations. C. N. Hurry will become supervisor of domestic geophysical operations.

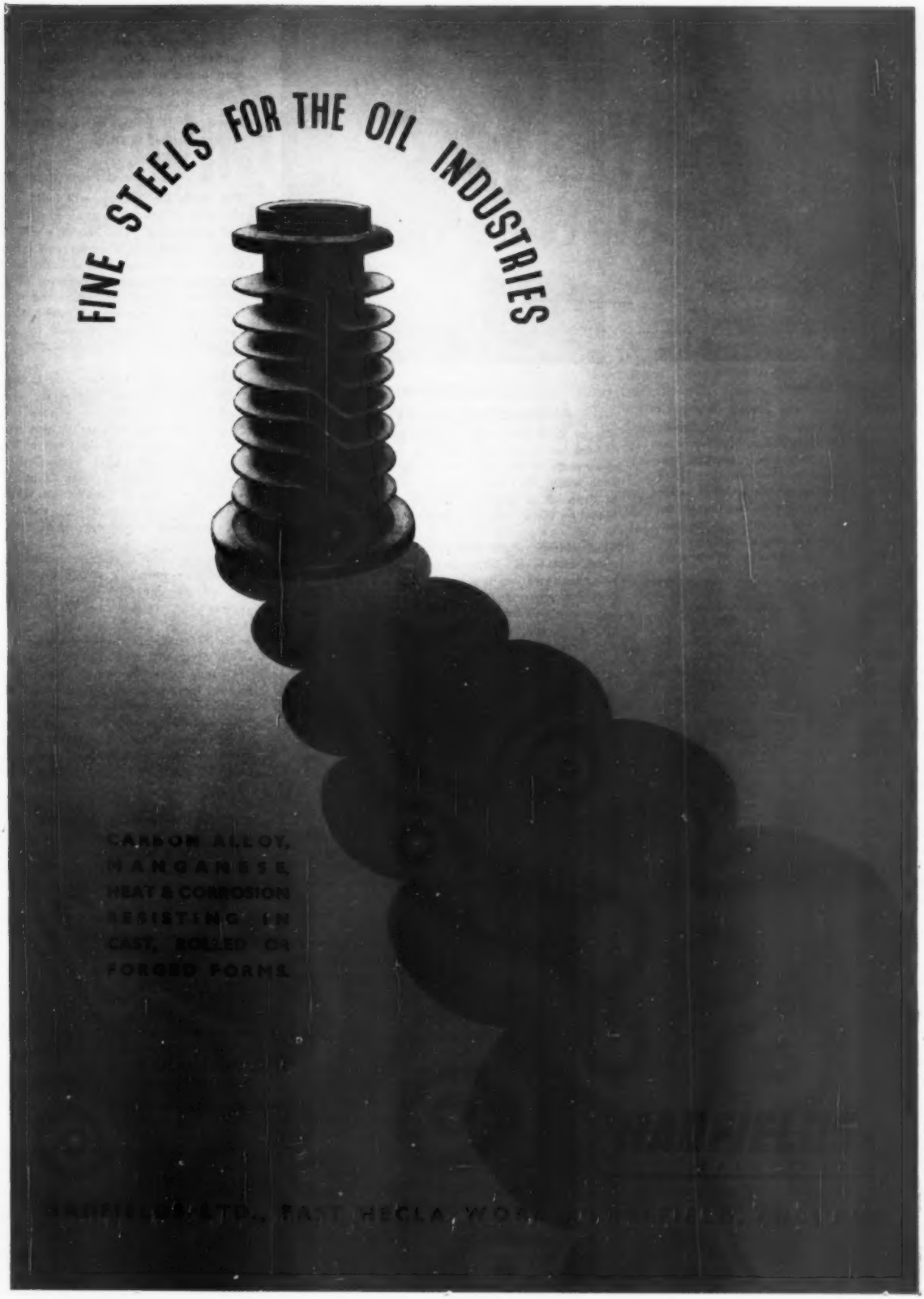
J. K. JAMIESON has been named manager of the engineering and development division of Imperial Oil Ltd., succeeding G. L. Macpherson who was recently appointed general manager of the company's refineries. Mr. Jamieson was born in Medicine Hat, Alberta; is a graduate of the University of Alberta; and attended the Massachusetts Institute of Technology where he received his B.Sc. degree. He began his career in the oil industry with the Northwest Stellarene Co. of Coutts, Alberta, in 1932. During the war he served in the Dominion Government oil controller's department. Before assuming his present position, Mr. Jamieson was associate manager of Imperial's coordination and economics department, Toronto.

JOHN P. PURCELL has been promoted to the position of chief engineer of The Bahrein Petroleum Co. Ltd. at the Bahrein, Persian Gulf refinery. Mr. Purcell succeeds Carroll A. Southwell who is now on assignment with California Texas Oil Co. Ltd in Holland.

W. J. B. DIXON has been appointed assistant to vice president (foreign) and H. D. Teeters has been named assistant to vice president (domestic) in Texaco organization changes announced today by L. H. Lindeman, vice president in charge of finance and economics, The Texas Co. Mr. Dixon was formerly an assistant treasurer, handling foreign financial matters, and Mr. Teeters was assistant treasurer handling domestic financial matters. Mr. Lindeman also announced the appointment of Elihu Madison as manager of Texaco's economics department.

Left to Right: Elihu Madison, W. J. B. Dixon, H. D. Teeters




FINE STEELS FOR THE OIL INDUSTRIES
CARBON ALLOY,
MANGANESE,
HEAT & CORROSION
RESISTING IN
CAST, ROLLED OR
FORGED FORMS.

Lester M. Snyder

LESTER M. SNYDER has been elected vice president of the Arabian American Oil Co. Mr. Snyder began his oil career with Standard of California in 1931. In 1939 he went to Saudi Arabia as chief field engineer for Aramco. After returning to the United States in 1947, Mr. Snyder served as assistant to the president. In his new assignment he will assist the president and the executive vice president in the general administration of the company's activities and will be responsible for the coordination of domestic and foreign activities.

WALKER L. TAYLOR, who has been in charge of western producing operations of Imperial Oil Ltd. for the past three years, has been appointed assistant general manager of exploration and producing operations thoroughout Canada. Born in Edmonton, he attended the universities of Alberta and McGill and then served overseas in World War I with the 19th Alberta Dragoons and the R.A.F. After the war he joined Imperial Oil and was placed in charge of drilling activities in Alberta. In 1923 he transferred to Peru and remained there until 1928, when he returned to Turner Valley. In 1942 Mr. Taylor went to Norman Wells in charge of development and exploratory operations, and four years later he was appointed manager of producing operations in western Canada. His headquarters now will be in Toronto.

Robert B. Curran, who succeeds Mr. Taylor as manager of Imperial's western producing operations, is a former vice president and director of the Carter Oil Co. Following his graduation from the University of Oklahoma in 1933, he joined the Carter Oil Co. as production geologist and scout. He became a vice president of the company in 1947 .

S. G. COULTIS has been made vice president and general manager of the Imperial Pipe Line Co. Ltd. Mr. Coultis arrived in Canada in 1913 following graduation from the University of Michigan as a chemical engineer. He worked for the City of Calgary for three years and then became engaged in field operations in Turner Valley. In 1921 when the Royalite Oil Co. was formed, he was its first employee. At first he was plant superintendent, but he also had an interest in production and pipelines and in 1935 became field superintendent. Later he played a leading part in setting up the Valley Pipe Line Co., and until his recent appointment was president and general manager of that company.

DR. CURTIS H. BAYLOR, former professor of medicine at the American University of Beirut, Lebanon, has been appointed assistant medical director of The Texas Co. Dr. Baylor went to Beirut in 1938 as assistant professor of medicine at the university and was successively associate and full professor, terminating his post last June. In addition to his teaching, he was head of the medical service of the American University Hospital.

George R. Brown

Awarded Achievement Medal

George R. Brown, executive vice president of Brown & Root Inc. in Houston and long associated with the southwest's oil industry as a builder, returned to his alma mater, the Colorado School of Mines at Golden, on Sept. 29 to receive a Distinguished Achievement Medal on the school's 75th anniversary.

The Colorado school medal is in recognition of accomplishments of distinction in mineral engineering and administration in related fields. At present Mr. Brown is chairman of Texas Eastern Transmission Corp., vice president of Highland Oil Co. and Esperado Mining Co. and the Texas Railway Equipment Co. He is a director of the First National Bank of Houston, the Southland Paper Mills and the International Telephone and Telegraph Corp. During the past war he was a general partner in Brown Shipbuilding Co., which put out 350 combat ships for the Navy and won not only the Army-Navy "E" award for the yard but a Presidential Certificate of Merit for Mr. Brown and his brother, Herman Brown.

Honor Seamen Lost in War

Ceremonies in honor of 141 merchant seamen who lost their lives aboard Sun Oil Co. tankers sunk or damaged during World War II was held both ashore and at sea on Oct. 8. The observance ashore featured the dedication of a nine-foot bronze statue of a seaman, mounted on a granite pedestal, in a small park at the entrance to Sun's Marcus Hook, Pa., refinery.

At the same hour as the shore observance tanker crewmen assembled on ships at sea for memorial services followed by the traditional launching of commemorative wreaths upon the water.

The idea of erecting a memorial to Sun tanker seamen who were lost at sea as a result of submarine attacks originated with fellow crewmen. Later other Sun employees and the Company contributed to the fund that ultimately reached $75,000. It is believed that the memorial is the first of its type erected in honor of merchant seamen killed in war service. Mounted on its pedestal, the monument rises 17 feet above the surrounding area.

Evaporation Report Reprinted

The second edition of a technical report on "Evaporation Losses from Cone Roof Tanks" by R. C. Ulm of the Graver research and development department will soon be released. This paper was originally printed Oct. 8, 1946. Mr. Ulm's discussion covers vapor concentration in cone roof tanks, breathing losses, and filling losses with a summary of conclusions. The book contains formulae for figuring vapor concentration and losses and includes graphs and photographic illustrations. Copies of this reprint are available on request to Graver Tank & Mfg. Co. Inc., East Chicago, Indiana.

New Products Line

Construction of a new eight-inch products pipeline, extending 38 miles from Toledo to Fostoria, Ohio, has been begun by Standard Oil Co. (Ohio). The new line, to cost $700,000, will be parallel to the present six-inch line. Completion is scheduled for early in December. Sohio now operates 332 miles of petroleum product pipeline in Ohio.

To Build New Pipe Mill

The A. O. Smith Corp. will build a new $5 million pipe mill in Houston to produce welded steel line pipe and well casing. The line pipe will range from 8⅝ up to 30 inches in diameter and larger, if required, and will be fabricated in uniform lengths of 40 feet. The plant will have a capacity of from 30,000 to 35,000 tons of pipe per months and will be the second largest mill in the country for the production of welded pipe. The largest is operated by A. O. Smith in Milwaukee.

The new plant will be adjacent to the present A. O. Smith Houston Works and to the plant of Sheffield Steel Corp. which will provide most of the steel. The new operation has been set up as a separate company under the name A. O. Smith Corp. of Texas with stock held equally by the A. O. Smith Corp. of Milwaukee, Wis., and the Sheffield Steel Corp., a subsidiary of Armco Steel Corp. of Middletown, Ohio. Construction of the plant will start at once, and it is expected to be in operation by the summer of 1950.

The new plant will effect tremendous savings in the cost of transporting steel and pipe to the Southwest and will be convenient for low cost water shipment for export.

Sheffield Steel is the only producer of open hearth steel in the State of Texas. The mill was started early in 1941 and during the war it supplied vast quantities of steel for ship-building in the Gulf Coast area and for other armament requirements. Capacity has since been expanded to about three and one-half times that of the original plant. More than 1,000 carloads of raw materials per month will be needed including coal from Oklahoma, iron ore, scrap and limestone from Texas.

The new plant will in no way affect the present operations of A. O. Smith in Houston. At the request of the Navy, A. O. Smith operated a plant in Houston during the war. At the end of the war, A. O. Smith bought the plant and since then has been manufacturing pressure vessels, liquefied petroleum gas systems and vertical turbine pumps. The company also maintains a district administrative office in Houston that handles the sale of all A. O. Smith products in eight Southwestern states.

In addition to the manufacture of large diameter welded steel pipe, the company is one of the largest makers of automobile frames and pressure vessels for oil refineries. It makes welding electrodes and welding machines, electric motors, gasoline pumps, and meters for measuring the flow of petroleum products.

Presses used by A. O. Smith Corp. in forming tubes in three steps from flat skelp.

SAVINGS TO EVERYBODY—

Pipe Lines Help!

OFTEN oil must travel thousands of miles before reaching your dealer.

And that's where pipelines serve you well . . . for in many cases they're *the most efficient, cost-cutting oil carriers there are.*

Pipelines are part of an efficient, integrated operation designed to keep your Mobilgas dealer competitive—supplied with high-quality products *at the right price.*

Efficiency is the reason why we laid 3,000 miles of new pipelines last year alone . . . why we bought new tankers and refining equipment, improved operations every step of the way from oil field to you.

Today, 45,000 independent Mobilgas dealers, 1,400 independent Mobilgas jobbers serve millions of motorists a day and are constantly creating bigger business opportunities for themselves.

Everybody benefits from competitive efficiency!

YOUR NATION
depends on strong industries . . .

YOUR INDUSTRIES
are only as strong as your Companies

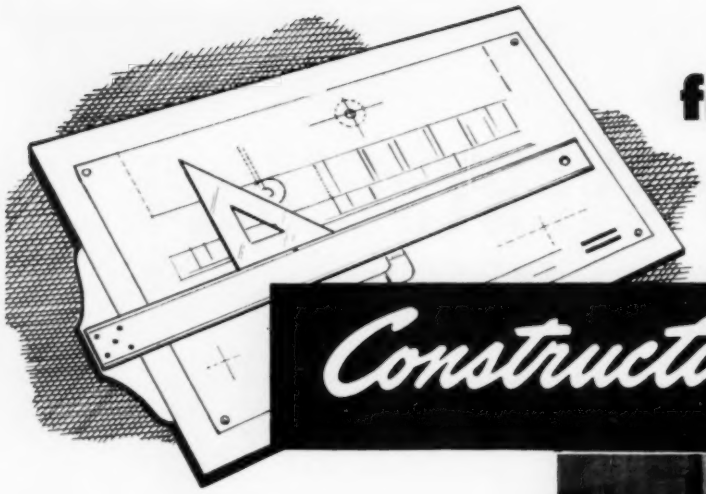
YOUR COMPANIES
are only as strong as their ability to give you

Your Biggest Money's-Worth!

SOCONY-VACUUM

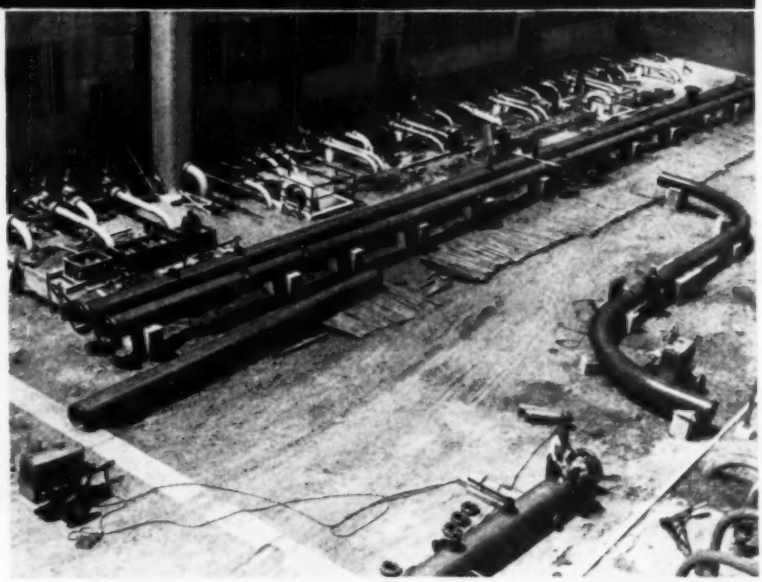
The Sign the Nation Knows . . .
Builds as the Nation Grows!

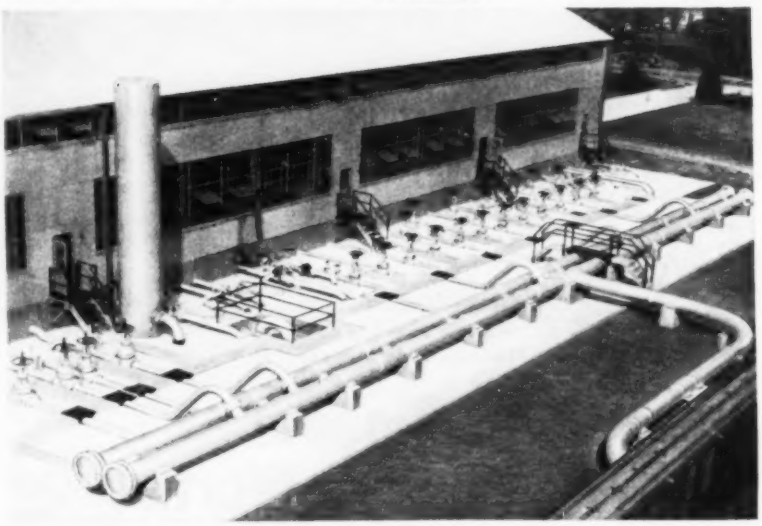
SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION



from drawing board to finished job . . .

Construction by GRAVER





■ Graver Construction Service goes all the way to meet the requirements of the petroleum and process industries — from engineering and planning . . . through material procurement . . . to finished erection.

This complete service covers every step of practically any type or size of project — refinery units or complete refineries . . . piping . . . process equipment dismantled and re-erected . . . pipe line terminals . . . pipe line pumping stations . . . chemical plants . . . recovery plants . . . auxiliary equipment for synthetic rubber plants . . . auxiliaries to all types of refinery equipment.

Experienced personnel and full equipment are maintained at strategic locations for jobs involving foundations . . . structural steel . . . erection of heavy vessels . . . piping . . . brick work . . . painting . . . machinery setting . . . instrument boards . . . and electrical work.

No matter what your requirements may be — maintenance and repair . . . expansion or modernization of existing equipment . . . installation of new facilities — get in touch with the nearest Graver office *at once*.

GRAVER CONSTRUCTION CO.

424 Madison Avenue, New York 17, New York

ENGINEERING DEPT.: 880 BERGEN AVENUE, JERSEY CITY, NEW JERSEY

GRAVER — CHICAGO — HOUSTON

A DIVISION OF GRAVER TANK & MFG. CO., INC. EAST CHICAGO, IND.

Stainless Steel Fabrication

Just off the press is a colorful new bulletin by Graver Tank & Mfg. Co. Inc., East Chicago, Ind., titled "The Hands of Skill in the Fabrication of Stainless and Alloy Steels." This bulletin discusses the importance of design and selection of materials in working with stainless and alloy steels. It also illustrates some typical examples of stainless steel fabrication for the petroleum, chemical and metal-working industries. Copies are available on request.

Graver Announces Expansion

E. N. Gosselin, president of Graver Tank & Mfg. Co., Inc., has announced the establishment of the Graver Water Conditioning Co. as a division of the company to extend the operations which have been conducted by the Graver water conditioning and process equipment department. Graver has been actively engaged in the water conditioning field for 40 years, and the expansion of the staff and facilities at this time is made to provide individualized and complete technical, chemical, engineering, manufacturing and erection services for all water treatment and liquid conditioning requirements.

World Petroleum Congress

The third World Petroleum Congress will be held in the Netherlands during May or June 1951. The first Congress was held in London in 1933 and the second in Paris in 1937.

The secretariat is established at 30 Carel van Bylandtlaan, The Hague, to which address the names of those who propose to attend the Congress should be sent. A circular giving full particulars will be forwarded to interested parties in due course. The Congress will last one week. It has been decided that French and English shall be the official languages.

The purpose of the Congress is to provide an opportunity for the scientific discussion of all technical subjects appertaining to the petroleum industry or allied to it. These scientific discussions will be of a high standard, as it is to be expected that the Congress will be attended by representatives of all branches of the petroleum industry throughout the world.

Presents Seismic Unit To School

A 12-trace reflection seismic recording unit has been presented to the Colorado School of Mines, Golden, Colorado, by Seismograph Service Corp., of Tulsa. Dr. J. E. Hawkins, vice president, made the presentation in Tulsa on Sept. 7. The equipment includes a complete operating unit with camera, amplifier, geophones, cables, recording paper, etc., mounted on a Chevrolet truck. It will be used for practical field instruction in geophysical problems related to the exploration for oil and gas.

This is the third unit to be presented by Seismograph Service Corporation to educational institutions in the past two years. Previously a complete unit was given to Koninklijk Nederlands Meteorological Institut, De Bilt, Holland, and early this year a similar unit was given to the geophysical department of The University of Tulsa.

"Pre-Fab Town" for Argentina

Nearly two hundred buildings for a small transportable "town," complete with bungalows, offices, workshops, kitchens, dining rooms and stores, have been shipped from Slough, Bucks, England, to Argentina by Structural & Mechanical Development Engineers Ltd. The buildings are all to a special design, introducing a completely new method of erection, made up of panels which are assembled on site entirely by hand and without the use of loose bolts, etc., or other normal method of fixing. Each panel, which consists of an external corrugated aluminum alloy sheet carried on an aluminum frame with glass silk and interior wall board lining, is joined to its neighbor by a patented system of special catches and sliding bolts. Dismantling for subsequent moves also is quick and easy.

Rees on South America Trip

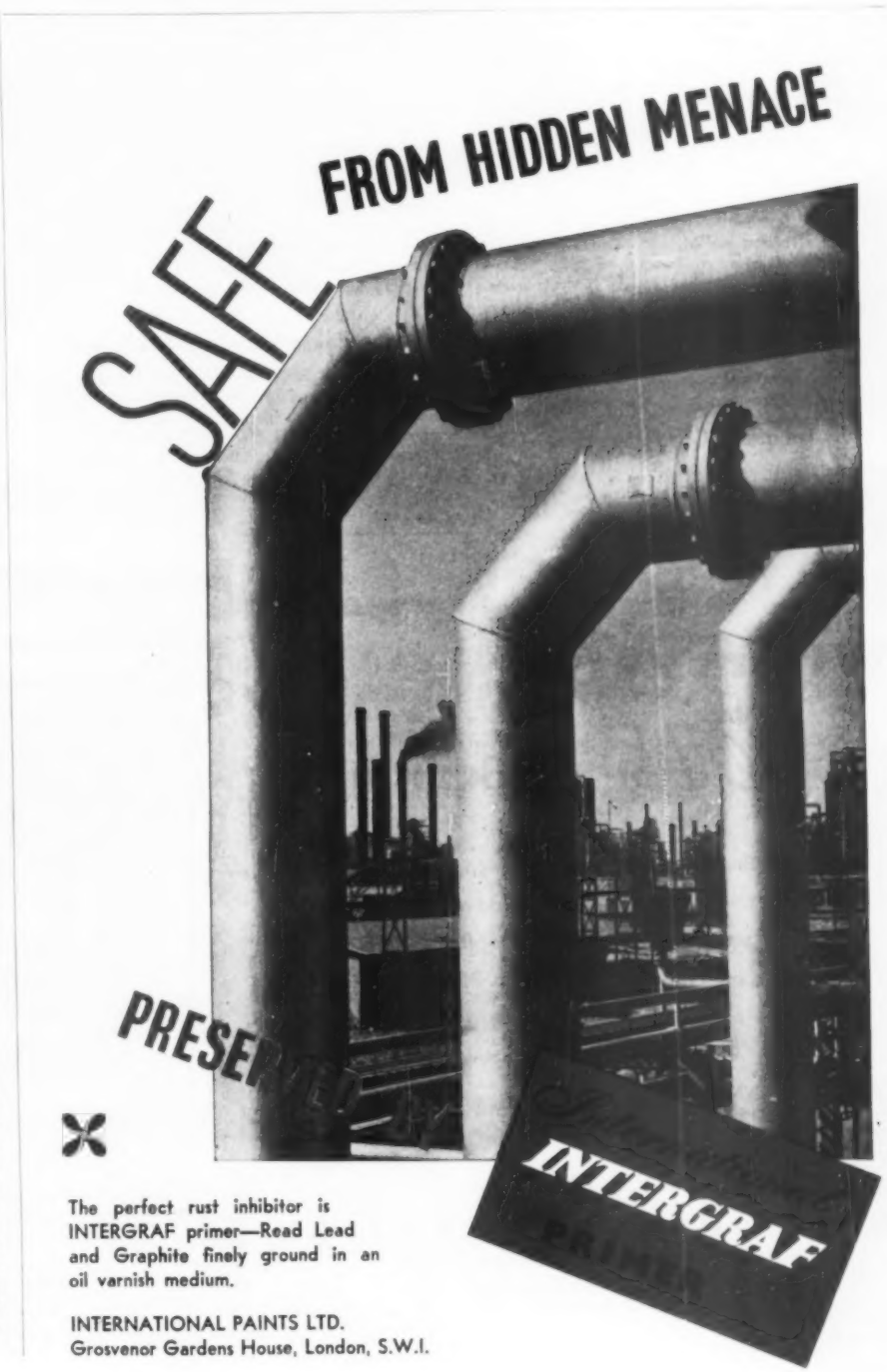
Earl Rees, Patterson-Ballagh export manager, is currently renewing acquaintances in Mexico City enroute to South America. After visiting the oil fields in Venezuela and Trinidad, Mr. Rees will return via the Patterson-Ballagh New York office.

Plans Specialty Plant

Universal Oil Products Co. has purchased a 600 acre tract between Shreveport and Mooringsport for the construction of a plant for the manufacture of specialty products. Actual construction of the plant will depend on one or two major factors on which decisions are pending, but if those decisions are favorable then his company will start construction on the first unit as rapidly as possible.

To Build Lake Tanker

Construction of the largest oil tanker ever to be built in a Canadian shipyard is a part of the program for bringing western crude oil to eastern Canadian markets, John R. White, vice president of Imperial Oil Ltd., has announced. The tanker will be 620 feet in length with a speed of 13 knots and a carrying capacity of 115,000 barrels. During the course of a navigation season the ship is expected to move more than five million barrels of oil from the projected pipeline terminal at Lake Superior to the refinery at Sarnia. Construction contract has not yet been let.



The perfect rust inhibitor is INTERGRAF primer—Red Lead and Graphite finely ground in an oil varnish medium.

INTERNATIONAL PAINTS LTD.
Grosvenor Gardens House, London, S.W.I.

Left to right: L. B. Meaders, Harry P. Conroy, Fred R. Whitten

Halliburton Elects

Three new vice presidents to assist in directing the company's field operations have been elected by the Halliburton Oil Well Cementing Co. The new company officials are Harry P. Conroy, L. B. Meaders and Fred R. Whitten, who have been Halliburton's regional managers for the past four months. Mr. Conroy managed Halliburton's Gulf Coast operations for the company's south and southwest Texas and south Louisiana operating divisions; Mr. Meaders managed the central region, composed of north Louisiana, east, central and west Texas, New Mexico and California divisions; and Mr. Whitten was in charge of the northern region, made up of the Rocky Mountain, Oklahoma, Kansas and eastern United States divisions.

The new vice presidents will continue to manage their respective regions and in addition will be more active in shaping general company policy, according to John C. Halliburton, president.

Tribute to Col. Flanagan

A unique tribute was paid recently by the city of Cartagena, Colombia, to Col. James W. Flanagan, builder and former president of the Andian pipeline which has its terminus at Cartagena. The occasion was the unveiling of a bust of Col. Flanagan on the grounds of the Hotel Caribe, and it was marked by laudatory addresses, a parade of naval cadets and Colombian marines and a banquet at which Col. Flanagan was guest of honor.

It was in 1923 that Col. Flanagan negotiated the concession for a pipeline from Honda to Cartagena. The Andian National Corporation was organized, and in 1926 the line was opened to service connecting the De Mares fields with tidewater at Cartagena distance of 325 miles. It is of 10-inch diameter and has a capacity of 30,000 barrels daily with 10 pump stations located along its course. Subsequent looping of the line enlarged its capacity to 60,000 barrels. Operated as a common carrier, the line now transports oil from the Yondo, Cantagallo and Dificil concessions in addition to the output of De Mares.

At the time of its construction Andian was one of a very few pipelines outside the United States, and its building was looked upon as a noteworthy engineering feat. It has been an important factor in the development of Colombia's petroleum industry. In addition to his connection with this undertaking, Col. Flanagan has been keenly interested in Colombian progress and has been a benefactor of the country in many ways. He was responsible for the development and modernization of Cartagena and is regarded as the city's outstanding citizen by adoption.

Nylon Hawsers for Deep Sea Towage

The first use of large-size nylon hawsers for heavy deep sea towage has just been undertaken by the Overseas Towage & Salvage Co., Ltd., of London. The company's tugs "Dexterous" and "Marinia" have just successfully completed the delivery of six steam ferries from Holland to Istanbul, a distance of nearly 3,000 miles. For this purpose nylon hawers were used for the first time on a voyage of this duration.

Soon after the war British Ropes Limited carried out experiments with nylon rope up to six-inch circumference at their synthetic cordage factory at Leith, and at the request of the Overseas Company they extended these experiments to large dimension nylon hawsers for ocean towage work. It was found that a nine-inch hawser had an elasticity up to 40 percent, as against 16 percent of manila, and that when the tension was released, the hawser retracted to within a small percentage of its original length. The weight was only one quarter that of manila and so risk of underwater damage was considerably reduced.

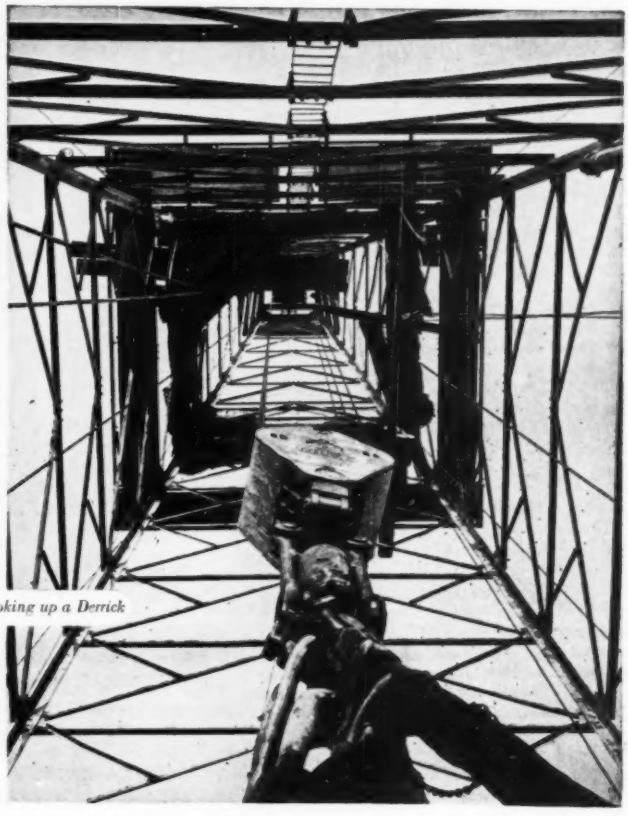
The first full-scale test was made when towing the stern half of a tanker from Brest to Kiel. Off Dover there sprang up a sudden gale of such severity that the tug's captain watched anxiously for strains which he asserted would have parted any other rope. The nine-inch nylon hawser, because of its high degree of resistance to shock loading, took the strain and the tow was safely delivered. This rope has now completed the towing distance of over 15,000 miles with vessels ranging up to more than 11,000 tons. The second rope, a ten-inch hawser, 540 feet long, was built up of 6.3 million filaments and has a breaking load of 90 tons. On this basis it compares favorably with the highest grade manila rope of 20-inch circumference.

Improved Well Head Features

A casing head manufactured by Atlas Engineering Works embodies two distinctive features: the double tapered slips which provide accurate alignment of pipe load the entire length of the surface, and the sealing member composed of two steel back-up plates with synthetic sealing rubber between. The latter is placed in the head through the blow-out preventers and held by lock screws in the casing head flange. The purpose of these features is to eliminate the hazard of crushing the pipe on the long, heavy strings now used in deep drilling.

Wherever OIL is king...

Rope is there to give loyal and long service. From the Caribbean to the East Indies and from Alaska to Tierra del Fuego, the Wire Ropes, Fibre Ropes and Cords of BRITISH ROPES LIMITED are recognised as essential aids in this vital, world-wide business of Oil production.



Looking up a Derrick

BRITISH ROPES LIMITED

Licensed to use the A.P.I. Monogram for Wire Rope

Head Office: DONCASTER, ENGLAND.

Oilfield Rope Sales Office: 52 HIGH HOLBORN, LONDON, W.C.1., ENGLAND.
Telephone: Chancery 8828. *Telegrams:* Britrope, London.

NEW YORK: 18 South Street. *MONTREAL:* 13 St. James Street West.

How to get your money out of gas . . .

Conversion of natural gas into synthetics, including gasoline, is increasing the need to save gas. Gas conservation is only a fraction of DRESSER INDUSTRIES' service to the oil and gas industry. But in this area, as in others, the Dresser line of equipment ranges in size for the smallest operator up to the largest installations ever built for repressuring, recycling, desulfurizing, for high- or low-pressure storage, for liquefying and for nitrogen removal.

To help you get your money out of gas, Dresser has equipment for returning gas to the ground for storage or for repressuring the well. If your gas is sour, Dresser can sweeten it to piping requirements with automatic Desulfo equipment which requires only a few hours' maintenance a month. Dresser engineers will gladly work with you. Free catalogs are available on all processes and equipment. Write to Dresser Industries, Inc., Terminal Tower, Cleveland 13, Ohio.

DRESSER INDUSTRIES INC.

TERMINAL TOWER • CLEVELAND 13, OHIO

THE ONLY COMPANY DOING AN OVER-ALL JOB } *from well to refinery for the Oil Industry— from source to consumer for the Gas Industry*

BOVAIRD & SEYFANG Manufacturing Company, Bradford, Pa. • CLARK Bros. Company, Inc., Olean, New York • DRESSER Manufacturing Division, Bradford, Pa. • DRESSER Manufacturing Company, Limited, Toronto, Ontario, Canada • INTERNATIONAL Derrick & Equipment Company, Beaumont & Dallas, Texas; Torrance, California; Columbus, Marietta & Delaware, Ohio • KOBE, Inc., Huntington Park, California • PACIFIC Pumps, Inc., Huntington Park, California • ROOTS-CONNERSVILLE Blower Corporation, Connersville, Indiana SECURITY Engineering Company, Inc., Whittier, California • STACEY BROS. Gas Construction Company, Cincinnati, Ohio; STACEY-DRESSER Engineering Division, Cleveland, Ohio

PUMPS FOR THE WORLD

For 137 years, Evans have built pumps for operation in every part of Great Britain and all countries of the world, and this unrivalled experience is applied to every enquiry received today. It pays to send to Evans first!

Joseph Evans
& SONS (WOLVERHAMPTON) LTD.

MINING · INDUSTRY · MUNICIPAL · AGRICULTURE

Joseph Evans & Sons (Wolverhampton) Ltd., Wolverhampton, England. London Office: 32 Victoria Street, Westminster, S.W.1.

Again, it's a Pleasure to see you In Chicago

Standard Oil welcomes the 29th Annual meeting of the American Petroleum Institute to Chicago. We extend our sincere wishes that all of you will have an enjoyable visit and a successful, constructive convention.

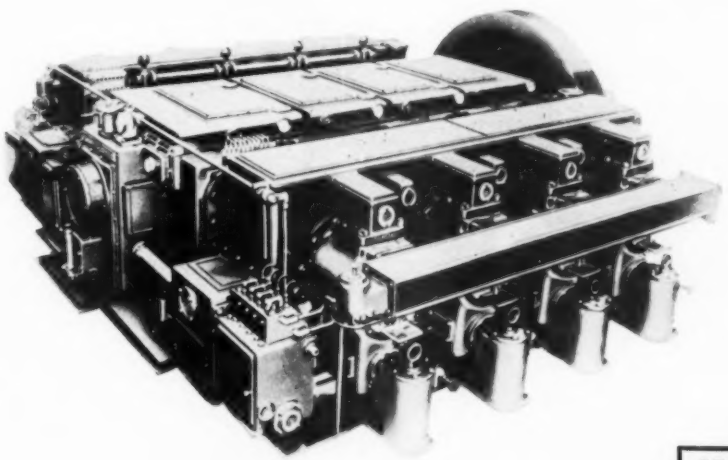
Standard Oil Company (INDIANA)

STANDARD

CROSSLEY-PREMIER

SLOW SPEED HORIZONTAL VIS-A-VIS TYPE ENGINES

for LARGE POWER STATIONS



POWERS UP TO 3000 B.H.P.

CROSSLEY-PREMIER ENGINES, LTD.

SANDIACRE NR. NOTTINGHAM ENGLAND

London Office: Langham House, 308 Regent St. W.C.I.

Oil Information Committee Increases Pace of Public Relations Program

(Continued from Page 93)

can be attributed largely to efforts of the O.I.I.C. throughout the year to obtain the greatest possible participation in the program, particularly by oil dealers and marketers. This drive to encourage men and companies having closest contact with the public to carry the progress story to their communities went into high gear early in March with the distribution of a Marketer's Package containing pattern speeches, ads, leaflets and a poster especially prepared for use by dealers.

Additional material was distributed in the following months to local oil men and put to wide use. This included the motion picture "The Last Ten Feet", a slide film by the same name and a second slide film entitled "Building for the Future"; ten pattern speeches; a number of radio speeches, round table discussions and spot announcements plus a weekly series of features for use on women's programs and a steady stream of leaflets, the most popular of which were "George Did It", "Your Local Oil Man", "Feeding America" and "90 Years of Progress."

At the same time national advertising continued unabated, with frequent stress put on dealers' problems. These ads were prepared in a distinctive white-on-black technique which made them easily identifiable.

A few statistics will serve to show the scope of the O.I.I.C. program to date. Since it started in 1946:

34,251,623 pieces of printed literature have been distributed.

151 advertisements have been placed in national magazines and 329 in the oil trade press.

Tie-in advertisements placed by individual oil men and oil companies have appeared in publications with a combined circulation of 597,578,832.

Program slide films have been seen by 1,239 audiences.

The new motion picture "The Last Ten Feet" has been shown before 264 public audiences and 560 prints of this film are now in circulation.

There are 1,728 copies of the "Petroleum Serves America" exhibit in circulation.

One hundred and seventy company publications have published 1,005 program stories, cartoons and other features.

3,744 radio interviews and discussions have carried program material.

Women's feature filler material has been used by 252 radio stations.

Reports have been received of 3,684 speeches by oil men before public audiences, while the number of talks before company employees is even greater.

What has been the impact of this vast amount of activity upon the general public?

A public opinion survey, similar to one made in 1946, was made by the Opinion Research Corp., again this year. It showed that, in a period when business in general is losing favor with the public, the oil industry has largely held its own ground.

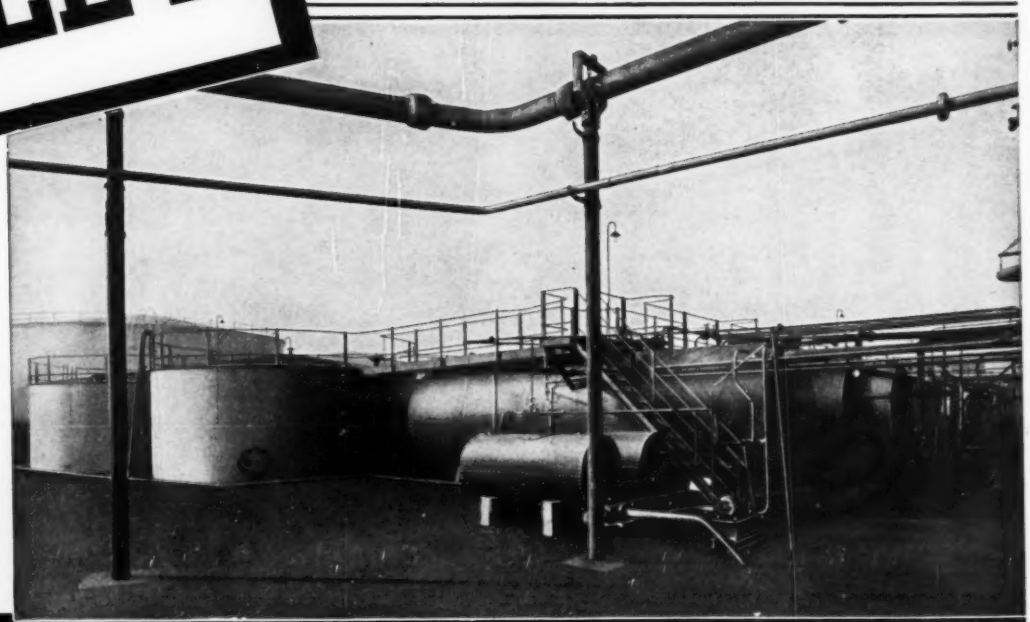
One of the most significant findings of the new survey, however, was that 65 per cent of the American people agreed with the O.I.I.C. basic slogan that "Petroleum Is Progressive."

Instrument Cabinets

A new line of standardized metal cabinets for process control instruments and similar applications has been announced by Gilbert & Barker Mfg. Co. of West Springfield, Mass. This company is maker of the widely known Gilbarco line of service station equipment and oil heating equipment. The new cabinets are offered in four different types, with and without windows, for several different mountings. They are said to be considerably less expensive than individually built instrument housings.

OXLEY

WELDED STORAGE TANKS



Part of a battery of ten, electrically-welded steel storage tanks 9'x0" dia. x 30'0" long with tank in background 25'0" dia. x 10'0" deep. Erected at Ellesmere Port, Cheshire. (Photograph by courtesy of Lobitos Oilfields Ltd.)

OXLEY ENGINEERING CO. LTD.

OXLEY ENGINEERING CO. LTD · HUNSLET · LEEDS 10 · ENGLAND

London Office: WINCHESTER HOUSE, OLD BROAD ST., E.C.2.

OW 100

MADE-TO-ORDER UNITS

for Petroleum and Chemical Processes

If you are a prospective purchaser of any such units, you will profit by consulting with Sun Ship. Here you have the benefit of long experience, exceptional skills and unlimited facilities. These facilities include our favorable location, because of which we can ship by water all units too large to be transported by rail . . . Also, the Sun reputation for building, reconditioning or repairing tankers and cargo vessels warrants your consideration when planning the overhauling or expansion of seagoing transport equipment.

Sun

SHIPBUILDING & DRY DOCK COMPANY

SINCE 1916

ON THE DELAWARE • CHESTER, PA.

25 BROADWAY · NEW YORK CITY

Dakota and Muddy Strikes Step Up Denver Basin Play

(Continued from Page 57)

the southwest 10-acre position of each 40-acre tract.

Casing practice employed comprises setting the 9⅝-inch surface pipe at 260 feet. Open hole is carried to the Muddy sand encountered at an average depth of 5,400 feet where the 5½-inch pipe is set and cemented with 250 sacks. Average drilling time is 36 days. (See Table 3.)

Lakota sand oil reservoir extends over 300 acres. It is found at an interval of about 100 feet below the Muddy. An aggregate of 36,000 barrels of 32 gravity oil has been produced from three wells in the Lakota. However, these have been plugged back to the Muddy.

Meadow prospect six miles east of Horse Creek will be tested this fall by a 10,500-foot well to be drilled by Bridwell Oil Co. of Wichita Falls, Texas. The wildcat will be drilled on a 10,000-acre farmout in Townships 17 and 18 North, range 67 W, acquired from Seaboard Oil Co. of Dallas, Texas. This test showed slight oil stainings in core cut in the Muddy sandstone topped at 9,706 feet. On last report it was preparing to core at 9,804 feet and believed to be at the top of the Dakota sandstone series.

High per-well oil recoveries from the Muddy sandstone feature the small, faulted, depleted Greasewood field lying in eastern Weld county on the east limb of the Denver basin. More than 250,000 barrels of 42 gravity oil have been produced from the discovery well. Of this total, 213,234 barrels were produced from August 26, 1931, the discovery date, to July 1, 1940, flowing naturally. Average per well recoveries to Jan. 1, 1948 for the five original wells exceed 100,000 barrels. The lack of complete drilling development complicates any estimate of per-acre recoveries at Greasewood, but on the basis of 300 ultimate acres, the per-acre average recovery is calculated at 1,676 barrels to Jan. 1, 1948. August 1949 production data showed only two wells on production with a combined daily average production of 30 barrels.

The discovery well was Reiter-Foster Oil Co.'s Ida Johnson 1, located in the C NE/4 NW/4 of Section 24-6n-61w, which was completed for an initial production of 636 barrels of oil per day. Greasewood sand was topped at 6,639 feet (1,989 feet below sea level) and penetrated to 6,675 feet, total depth. A 34-foot oil column is established with completion of Greeley Oil Company's Gadbois 1-B, located in the C NW/4 NW/4 of Section 25-6n-61w, which was bottomed at a subsea elevation of 2,023 feet with top of sand at a subsea elevation of 2,011 feet, for an initial production of only 20 barrels per day, marking the southwest edge of production. In all five wells were drilled along a north-south line. Forty-acre spacing, initiated with the discovery well, was followed continually in the development of the field.

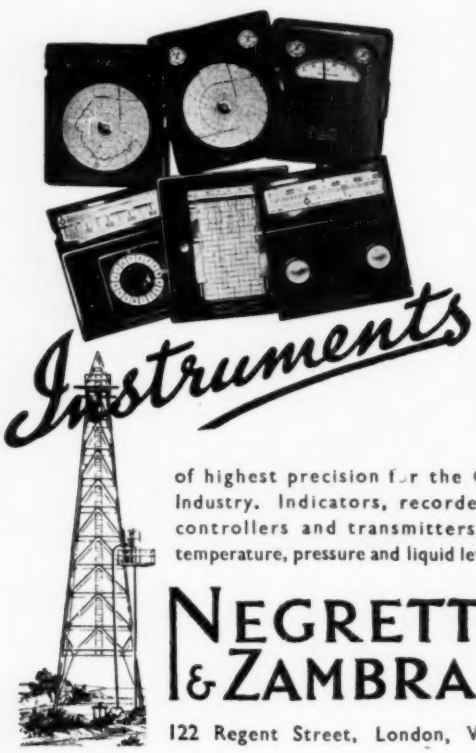
Surface structure of the Greasewood field is described by Lavington as that of a very low-dipping anticline which plunges gently N 70° W into the Denver basin.

Relationship of oil accumulation to geology is principally structural and partly stratigraphic. The wedge-edge of the reservoir occurs downdip from the accumulation, and the Muddy sandstone carries updip far beyond the locality of the pool. The north-northwest trending Niles fault, structural barrier situated on the township line east of the field, limits oil accumulation in that direction. Reservoir mechanism is internal gas drive.

Gross oil pay thickness varies from 21 to 36 feet. The crude averages 42° API and has a low sulfur content and an octane rating of 52. The reservoir media is described as a thin-bedded gray sandstone, in places quartzitic, with inter-bedded marine black-shale.

Synthetic Fuel Bibliography

More than 725 individual references to Bureau of Mines investigations on the production of liquid fuels from oil shale, coal, lignite and natural gas are contained in a newly revised bibliography on synthetic liquid fuel publications. The report covers publications and reports appearing up to May 1949. A free copy of the report, Information Circular 7534, "Revised Bibliography of Bureau of Mines Investigations on the Production of Liquid Fuels from Oil Shale, Coal, Lignite and Natural Gas (To 1949)," may be obtained by writing to the Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pa. The report was compiled by Norma Golumbic, Hazel C. Anderson and Robert C. Grass.



of highest precision for the Oil Industry. Indicators, recorders, controllers and transmitters of temperature, pressure and liquid level.

NEGRETTI & ZAMBRA LTD

122 Regent Street, London, W.1

ROTARY DRILLING HANDBOOK

Fourth Edition

Completely revised by Mr. J. E. Brantly with the assistance of twelve outstanding *drilling engineers* who revised chapters dealing with subjects in which they are specialists.

Here is an *on-the-job Reference* Book that every driller, roughneck, drilling superintendent, petroleum engineer, independent operator, oil field equipment manufacturer or salesman should own. More than 200 pages of time-saving tables and formulas.

Order the *Rotary Drilling Handbook today*—its use will increase your own personal productivity as well as that of the well you are drilling.

$7.50 per copy.

Send your orders to: World Petroleum, 2 West 45th Street, New York 19, N. Y.

or abroad: World Petroleum, 342, St. Paul's Corner, Ludgate Hill, London E. C. 4, England

LIMITED PRINTING **ORDER YOUR COPY NOW!**

BRILLIANT PERFORMANCE!

VEEDOL
MOTOR OIL

The World's Most Famous Motor Oil

TIDE WATER ASSOCIATED OIL COMPANY

ECA Aids French Refineries

Recovery projects to rehabilitate and modernize refinery facilities in France involving three separate plants have been approved by the Economic Cooperation Administration. Total cost of the projects, expressed in dollars, is $20,435,000, of which $3,900,000 represents dollar expenditures to be financed with ECA funds, the balance being in francs.

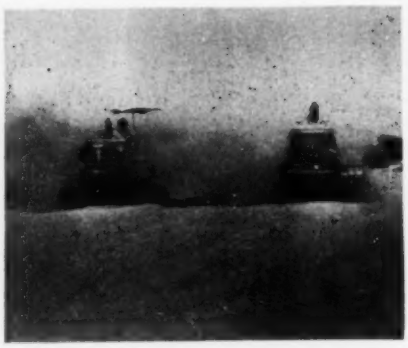
One project covers rehabilitation and expansion of the Donges refinery of Raffineries Francaises de Petrole de L'Atlantique, located near St. Nazaire, which was heavily damaged during the war.

A second project involves the installation of lubricating oil equipment at the Gonfreville refinery in northern France and alterations on a cracking unit at the La Mede refinery near Marseille. Both of these refineries are owned by the Compagnie Francaise de Raffinage.

The total cost of the Compagnie Francaise de Raffinage project amounts to $11,000,000, of which $3,150,000 represents expenditures to be financed with ECA funds. About $90,000 of ECA funds will be spent at the La Mede refinery and the remainder at the Gonfreville refinery. It is proposed to install facilities at the Gonfreville refinery to produce approximately 120,000 metric tons of lubricating oils and 10,000 metric tons of wax per year. The alterations on the cracking unit at the La Mede refinery are necessary in order to process satisfactorily the distillates from Middle East crude oils, which will be the raw material for both La Mede and Gonfreville refineries.

Fire Not Serious

A correspondent of The Petroleum Times, London, has reported that the refinery at Rjeka was not seriously damaged by fire or explosion, as reported in the press. A small fire consumed limited quantities of refinery waste, but there was no equipment damage and no sabotage.



A dust test for air cleaners at the International Harvester Company's new testing grounds south of Phoenix.

Expand Test Facilities

A tract of land, consisting of more than 4,000 acres located about 23 miles south of Phoenix in the foothills of the Salt River Mountains, will become the site of International Harvester's combined test facility for its industrial power and motor truck divisions. The area, leased from the Arizona State Land Department, has been used as a testing ground for International Harvester's line of industrial power equipment. Since the test and construction work began in 1946, many miles of roadways have been built throughout the area, and it is upon these roads that International motor trucks will be tested. The terrain provides varied test conditions, from smooth, level areas needed to test trucks at high speeds to rough, steep inclines that challenge endurance and power.

New Tanker Launched

Latest tanker to leave the slipways on the Clyde is Regent Leopard, built by the Blythswood Shipbuilding Co. Ltd. for the Bowring Steamship Co. Ltd. Mrs. Vos, wife of S. J. Vos, chairman of Trinidad Leaseholds Ltd., performed the launching ceremony. This is the first of three vessels for the owners which the yard will build. This, the first, will be of 12,000 tons deadweight, while the two later are to be 17,500 tons deadweight.

The Regent Leopard will carry 12,000 tons deadweight at 12 knots on an oil consumption of 12 tons per day. The first ship built by the Blythswood yard 30 years ago, also a tanker, carried 11,000 tons deadweight at 10½ knots on a coal consumption of 30 tons daily. Users of the new tanker will be Trinidad Leaseholds Ltd. The Regent Leopard is 460 feet long, has 27 main cargo oil tanks with a discharge capacity of 540 tons per hour.

Work Begun On Condor Site

Work on the site of the new one-million-ton-per-annum CONDOR refinery at Rho, near Milan, Italy, is progressing satisfactorily. At the same time planning and development work has started on the 100-mile, 10-inch pipeline which will carry crude oil from Genoa to the refinery. Distributing plans are not complete, but it is thought that CONDOR will sell through existing agencies—some of which, have up to now, based their business on the handling of imported products but will have to take their future supplies from Italian refineries.

Manchester Oil Refinery Ltd. of England will have a participation in CONDOR, and this arrangement will enable CONDOR to keep in close contact with modern developments in refining technique and in close touch with the market for crude oil and tankers. It is possible that CONDOR will cooperate closely with Petrocarbon Ltd., chemical affiliate of the Manchester companies, in the field of chemicals from petroleum, for which there is a great need in Italy. The geographical position of the CONDOR refinery in Rho, a suburb of Milan, would lend itself very well to such a development, as the main chemical industries of Italy are in that region, and the intermediate products could be easily and cheaply transported to the existing chemical factories in that area.

WEIR

AUXILIARIES for the OIL INDUSTRY

Steam, Diesel or Motor-Driven Pumps, Reciprocal and Centrifugal types, for all refinery duties; Heat Exchangers; Air Compressors; and all power plant auxiliaries for Boiler Feeding and Feed Heating. Write for Catalogue Section IL.8/ "Weir Pumps for the Oil Industry."

G. & J. WEIR LTD.
CATHCART : GLASGOW

Left to right: B. A. Hilliard, Jr., O. W. Morgan, Jr.

Byron Jackson Appointments

E. S. Dulin, president of Byron Jackson Co., announced the appointment of O. W. Morgan Jr. as manager of export sales of the company's oil tool division. Mr. Morgan will make his headquarters in New York City in mid-November. He will also represent the Patterson-Ballagh division of Byron Jackson and International Cementers Inc., manufacturers of a complete line of oil well cementing equipment. B. A. Hilliard Jr. will succeed Mr. Morgan as sales manager of the oil tool division. Both Messrs. Morgan and Hilliard entered the company's employ in the middle thirties and have a well-rounded experience in shop and field as well as marketing.

Transfers 60 to Houston

Continental Oil Co. will transfer six officers of the company and two department heads from Ponca City, Okla., to Houston, Texas. The group to be transferred, including members of their immediate staffs, will total about 60. Officials who will move are W. C. MacMillan, executive vice president; Harry J. Kennedy, vice president in charge of marketing; R. L. Bosworth, financial vice president; Serge B. Jurenev, vice president in charge of coordination and planning; A. W. Tarkington, treasurer, and Thomas F. Dowd, controller. Department heads who will transfer are W. E. Webb, manager, production department; and John Post, manager industrial relations department.

New Book

Physical Principles of Oil Production, by Morris Muskat (Gulf Research and Development Co.); published 1949 by McGraw-Hill Book Co., New York, 922 pages. $15.

In presenting this book to oil men, the author states that his work is not a pedagogic treatise. His intention is to present a conspectus of what is now known about the physical principles and facts underlying the mechanics of oil production. One of his principal objects is to clarify, for the practical man, many aspects of the matter that are still subject to speculation and conjecture, to generalize and improve the correlation between laboratory theories and field observation. He gives no handbook instructions for field operations.

Within these limits he proceeds to define the subject in terms of oil reservoirs, the nature of oil-bearing rocks, the confinement of oil reservoirs, the structural classification of oil reservoirs, the fundamentals of reservoir engineering, the subject of secondary recovery, well spacing, recovery factors and recoverable reserves. In between he takes plenty of space to present what is worth knowing about homogeneous and heterogeneous flow systems in uniform and non-uniform strata, and the dynamic and productivity indexes of these systems. Throughout the discussions the author sticks to pertinent facts and their relation which he shows himself able to communicate to petroleum engineering readers. The price is moderate for a book of this scope.

Left to right: David H. Conklin, George L. Tyler

Du Pont Promotes David H.Conklin

David H. Conklin, West Coast district manager for Du Pont's petroleum chemicals division, has been promoted to assistant sales manager with headquarters in Wilmington. Ray E. Miller, petroleum chemicals sales director, said Mr. Conklin will fill one of two assistant sales managerships in the division, reporting to Emory M. Fanning, sales manager. Mr. Conklin will be in charge of promotion activities at the start. E. Hearn Simpson will continue as assistant sales manager in charge of district offices and staff activities. George L. Tyler, West Coast sales representative, will succeed Mr. Conklin as manager of the district office in Los Angeles.

Mr. Conklin served in the Navy during the war and received the Order of the British Empire for meritorious service in connection with the repair of British ships at the U. S. Naval Operating Base at Londonderry, North Ireland. Mr. Tyler was secretary-treasurer of the California Natural Gasoline Association for nine years before he joined Du Pont in 1947.

Caltex Discusses Exchange Problems

In connection with the petroleum aspects of the sterling-dollar problem which have been under discussion in Washington for the past few weeks between the British and American governments, it is now understood that the Caltex group has begun discussions with the British of ways and means of adjusting its sterling oil operations to fit the new conditions of international exchange. The Caltex group has all of its oil production, refining and marketing operations in Europe, Asia, Africa and Australasia, and is an important factor in sterling area oil operations.

To Distribute Manchester Products

Products of Manchester Oil Refinery Ltd. are now being marketed in the United Kingdom through their new company, Manchester Oil Refinery (Sales) Ltd. Overseas distribution and sales of the products of Manchester Oil Refinery Ltd. will continue to be handled by Raven Oil Co. Ltd.

The management and staff of the subsidiary companies, Petromor Ltd., Puremor Ltd. and British Transformer Oil & Lubricants Ltd., together with all existing facilities, will be used to operate the sales divisions of the new company. The sales divisions are: lubricants division, transformer oil division, white oils division, chemical products division and wholesale division. A feature of the new organization will be a technical service working from the refinery itself.

New Producers in Gulf

Stanolind Oil and Gas Company has completed a producing well seven miles off Cameron Parish, Louisiana, in the Gulf of Mexico. The well was drilled to a total depth of 9,044 feet. Pay zone is in the Lower Miocene. On a drill stem test it flowed at the rate of 447 barrels per day with 1,425 pounds tubing pressure on a ¼-inch bottom hole choke and 3/16 top hole choke. The crude has a corrected gravity of 34.9° and gas-oil ratio of 540:1.

Other late discoveries are those of Phillips-Kerr McGee and Barnsdall Oil Co. The former is in the West Cameron area, offshore Louisiana, producing from the Miocene at a depth of 10,400 feet and flowing on test at the rate of 935 barrels daily. The Barnsdall find is offshore from Plaquemines Parish, Louisiana, producing through perforations at 5,788-5,818 feet on drill stem test at the rate of 230 barrels daily.

Sells Eastern Properties

Continental Oil Co. disposed of its eastern marketing properties in Virginia, Maryland and the District of Columbia to Cities Service Co., effective Nov. 1. Properties transferred to Cities Service comprise 51 service stations, 23 bulk plants, three ocean terminals and two barge terminals. The ocean terminals are located at Baltimore, Md., Norfolk, Va., and Wilmington, N. C. The barge terminals are located at Richmond and Warsaw, Va. Shell Oil Co. Inc. at the same time acquired 14 service stations representing properties in Baltimore, Washington and Norfolk not taken over by Cities Service. Properties involved are valued at approximately $7,500,000.

SEISMIC & GRAVITY SURVEYS

ON LAND AND SEA ★ FOREIGN AND DOMESTIC

★ Assured positive results . . . based on years of practical experience performing geophysical surveys delineating oil structures.

John L. Bible Ray St. Germain U. E. Noose

TIDELANDS EXPLORATION CO.

2626 WESTHEIMER HOUSTON, TEXAS

★IN CANADA: 513-6A St. NE—Calgary, Alberta, Canada

Phone—MAIN 4924

Complete Core, Geochemical, Oil and Gas and Paleontological Analysis through

Petroleum Engineering Associates, Inc. Laboratories
709 South Fair Oaks, Pasadena 2, California

Oil Properties Consultants, Inc.
711 So. Fair Oaks, Pasadena 2, California

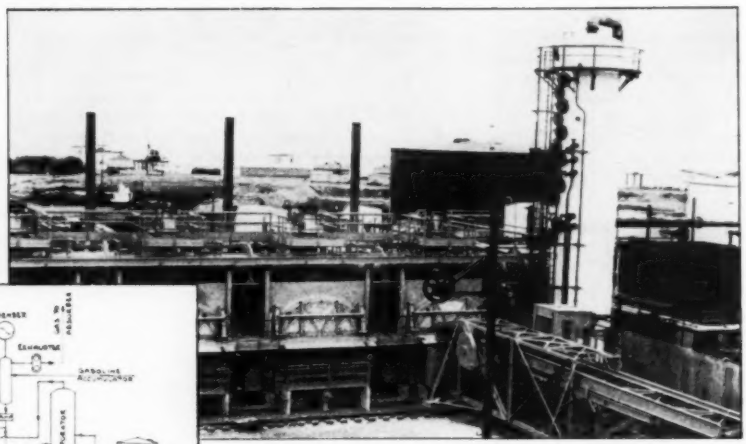
Affiliated Companies

Petroleum Industry Consultants, C.A.
Apartado 1953, Caracas, Venezuela

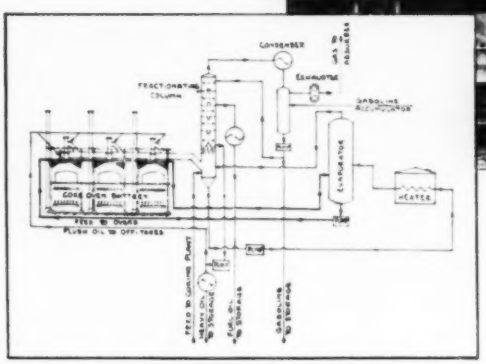
Petroleum Industry Consultants,
Havana, Cuba

PROBLEM: **How to Profitably Convert Residuums to Metallurgical Coke or Electrode Carbon**

SOLUTION: **Curran Carbonizing Process: A flexible and economical method of high temperature coking**



Curran Liquid Hydro-Carbon Coking Plant



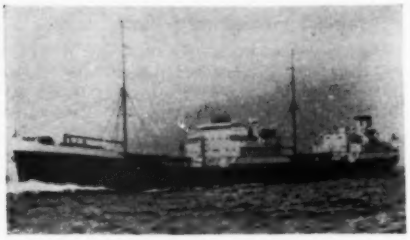
Simplified Flow Diagram of Curran Process

The problem of profitably reducing petroleum residues to high-quality solid coke has been met and mastered in the Curran Carbonizing process . . . a tried and proven method of high temperature coking that should interest every organization desirous of converting heavy residues to readily saleable products.

The facilities of our completely equipped Pilot Plant are available for tests of your material on a commercial scale and at actual cost to us. Inquiries are invited and will receive prompt attention. Wire, write or phone.

Curran Carbonizing & Engineering Co.

314 N. BROADWAY • CEntral 8972 • ST. LOUIS 1, MO.



Bulk Transport of Bitumen

To aid in supplying the growing European demand for materials used in road building and industrial construction, the Shell organization has equipped three of its tankers to handle bulk shipments of bitumen (asphalt) from Curacao, Netherlands West Indies. The vessels are fitted with center tanks with a capacity of 4,500 barrels each and are equipped with heating coils and jacketed lines to maintain pumping temperatures. In addition to the space required by the center tanks, wing tanks will be used for shipments of black oils.

Bulk stations to receive deliveries of the cargoes are being erected at Copenhagen, Denmark, and Setubal, Portugal, and similar facilities will be provided at other points as the service expands. In the western hemisphere shipments have been made in bulk for several years between the Caribbean and North Atlantic ports. The three vessels thus far assigned to Shell's transatlantic service are the "Lembulus," the "Labiosa" and the "Liparus," each of 9,000 tons deadweight.

Sinclair's $250,000,000 Production Program

Sinclair Oil Corporation is embarking on a program to increase its crude oil production by at least 50,000 barrels daily within the next five years, according to a statement by President P. C. Spencer following a recent meeting of the board of directors. Having completed the modernization of refineries, the extension of pipelines and the improvement of marketing facilities through an expenditure of $150,000,000, the next logical step, said Mr. Spencer, is to bring crude production more closely in line with these expanded facilities.

Sinclair has oil leases in the United States covering more than 5,000,000 acres, of which 225,000 are classed as proven. Locations for more than 400 wells are available on blocks of acreage already producing. Projected operations will extend to semi-proven and wildcat areas.

While the company is in a strong position financially with cash and short-term government securities exceeding $132,000,000 on June 30, it is anticipated that the stepped-up production program may involve overall expenditures of $250,000,000 or more. Arrangements have been made with an insurance company for a long-term loan of $50,000,000 at three percent to be drawn upon in instalments with repayments beginning in the 21st year of the 25-year term.

Shell Buys Jet Plane

A program to study performance of jet fuels and lubricants in actual flight operation in the first jet-equipped research plane to be operated by any oil company, has been undertaken by Shell Oil Co. The plane, recently acquired from the Air Force, is being fitted with analytical and recording instruments. It is a B-26 type bomber equipped both with twin reciprocating engines and with a jet engine. Four men are permanently assigned to the plane: a research engineer, a pilot, a mechanic and an instrument man. Overall direction of research rests with a six-man steering committee headed by J. H. Doolittle and including members of Shell technical departments.

QUALITY in world famous W-S Forged Steel Fittings starts with proper selection of basic metals. Long before problems of forging, machining and testing arise, W-S technicians concern themselves with end uses in the determination of proper steel analysis for the various jobs Fittings must perform.

For example, working closely with Refinery engineers, W-S technicians helped establish standards for the physical properties of various fittings alloys . . . were first to use fitting materials of closely controlled uniformity (low sulphur-low phosphor) for the special demands of refinery services.

And, W-S has kept pace with changing methods in other processing industries too, meeting each new challenge with stronger, tougher alloys, producing forged fittings always correct — metallurgically.

They meet the broad, diversified needs of all industry and are available in both screw and socket weld types. Forged and precision machined of stainless, carbon and alloy steel . . . . Investigate.

WATSON-STILLMAN

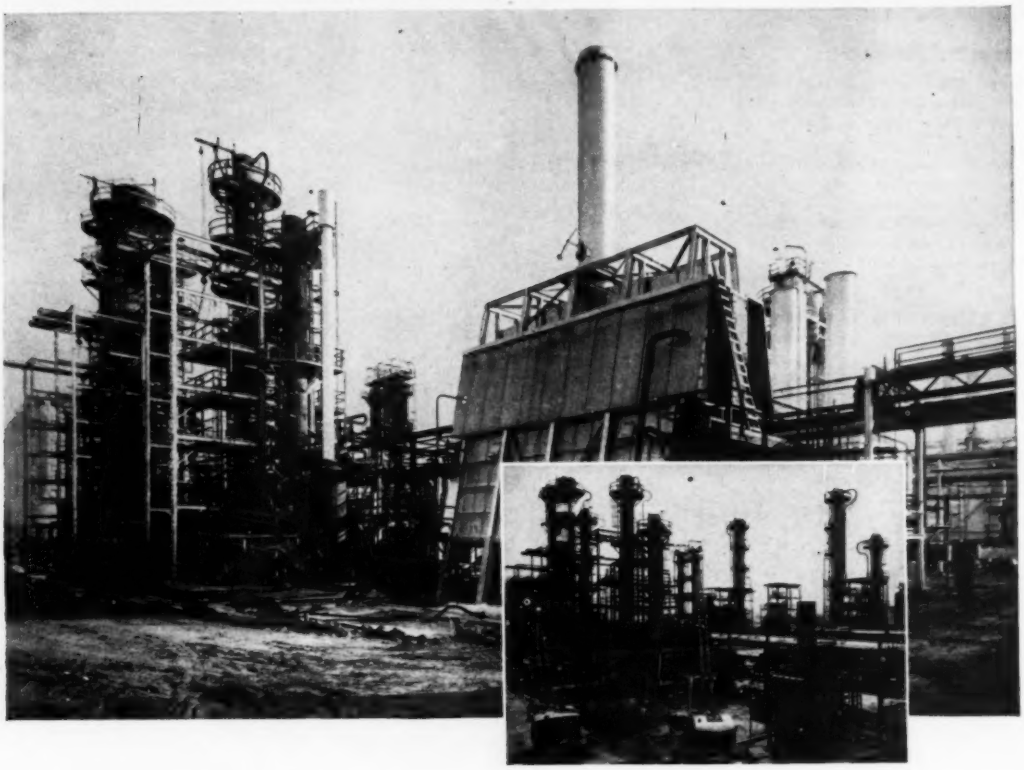
ROSELLE, NEW JERSEY

• ESTABLISHED 1848 •

9-J-34

SOLD THROUGH LEADING DISTRIBUTORS

N.B. While it is axiomatic that return on investment—the *ultimate earning power* of a refinery unit when actually on stream—is the only true evaluation of competitive engineering recommendations, initial plant costs remain a major factor in refiners' decisions on plant installations. M. W. Kellogg takes specific steps to *minimize initial plant costs* consistent with the achievement of *highest ultimate earning power.*



A CONVERSION THAT SAVED THOUSANDS

In modernizing refineries, it is naturally customary to convert existing equipment wherever possible. However, in a recent job for a mid-western refiner, Kellogg carried this construction principle to unusual lengths—with gratifying results in reduction of costs.

The refiner needed *complete* lube facilities. And he did not require an alkylation-isomerization unit which he already had. Kellogg took over this unnecessary unit—on the ground as it stood—and reengineered it.

Adding new equipment only when nothing was available for conversion, Kellogg transformed the unwanted unit into a modern lube plant, a plant employing vacuum distillation, propane fractionation, phenol treating, propane dewaxing and clay treating.

The small inset picture above shows the alkylation plant just as Kellogg started construction. The large picture, taken from the same angle just prior to completion, indicates the scope of the revision. It also shows clearly the utilization of existing equipment which saved this refiner a substantial portion of material costs, *a saving well into six figures.*

Any engineer knows that doing such a job and coming out with a truly efficient plant at the end is quite a trick. But it is an even greater trick to organize the work on the construction lot so that the savings gained through using existing equipment are not frittered away.

Such a task calls for the closest cooperation between engineering, scheduling, purchasing and construction. Completion of this successful lube plant with substantial dollar savings is additional proof of Kellogg's firm conviction that the integrated and complete organization is the only true approach to LOW INITIAL COSTS.

THE M. W. KELLOGG COMPANY

A SUBSIDIARY OF PULLMAN, INC.

ENGINEERS TO THE PETROLEUM INDUSTRY

NEW YORK JERSEY CITY LOS ANGELES TULSA HOUSTON TORONTO LONDON PARIS

New Pumping Equipment Plant

A modern new plant for the production of pumps, sucker rods, couplings and other oil equipment has been opened by the D+B division of Emsco Derrick and Equipment Co. at Garland, Texas, 15 miles from Dallas. The three buildings making up the plant occupy a 15-acre site.

D+B's new mid-continent plant features the latest machinery for the manufacture of subsurface pumping equipment. Many pieces of machinery in the new plant are the only ones of their kind in the world, having been specially designed for the installation. Typical of these new, modern, custom-built machines are the full-length normalizing and drawing furnace for the precise heat treatment of sucker rods, the Barnes honing machine for precision honing of interior surfaces of pump tubes and working barrels to a smooth, mirror-like finish accurate within ±0.0005 inches, and the Tocco high frequency induction machine for case hardening of sucker rod couplings to a uniform depth of hardness.

The shop building is of steel frame construction, composed of five 50-foot bays, each 360 feet long. Each bay is serviced by a five-ton monorail-type bridge crane. Craneways are provided with cross transfer tracks permitting movement of cranes into other bays of building. A spur of the M-K-T railroad runs inside the main shop building in the warehouse area. Five railroad cars can be spotted within the building, permitting protected loading and unloading in all kinds of weather. The reinforced concrete shop floor is elevated, thus allowing railroad cars to be unloaded at car floor level. The D+B testing laboratory and various shop offices are also located in the main shop building. Laboratory equipment has been installed for the testing of materials, control of processes and development of D+B products.

The new Dallas plant of Emsco Derrick & Equipment Company.

The D+B division of Emsco Derrick & Equipment Co. was originally founded in 1905 by Daniel Daniels with a 28 by 46-foot shop at Los Angeles. Oil well plunger pumps at that time consisted of cast iron working barrels, made from cylindrical castings bored out and reamed smooth, equipped with steel plungers and rough cast iron collars on each end. Mr. Daniels developed and perfected the first sectional liner pump, now the accepted standard of the industry for efficient service under severe pumping conditions. In May 1908 Lysle P. Burgess joined with Mr. Daniels in building the revolutionary sectional liner pump, and in 1909 the young company was incorporated as the D+B Pump and Supply Co. From this modest beginning the D+B has continued to grow and expand.

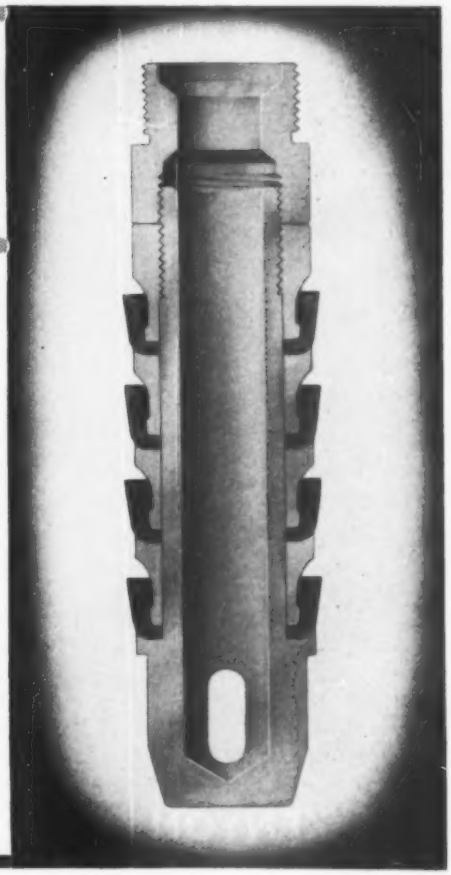
New Wholesale Oils Ltd. Offices

H. F. Smith has been appointed chairman of Wholesale Oils Ltd. and George Clark has been named managing director. Mr. Smith has been in active charge of the company since the de-merge of the Petroleum Board. The company recently opened new offices at 87 Bishopsgate, London, E.C. 2. George Clark has been connected with the wholesale lubricating oil trade for over 30 years, first with the Sinclair Company and subsequently operating his own company until he joined up with Cities Service in the formation of Wholesale Oils Ltd.

Cut Production Costs!

WITH TOUGH WEAR-RESISTING ANGUS CUPS

Angus Valves and Seating Cups are made from tough, wear-resisting "Gaco" Fabric composition. They have exceptional resistance to abrasive action, crude oils and gases, at high working pressures. Supplied in all A. P. I. standard sizes they are available in hard, medium and soft grades.



ANGUS CUPS

are supplied in accordance with A.P.I Std. No.11A

GACO

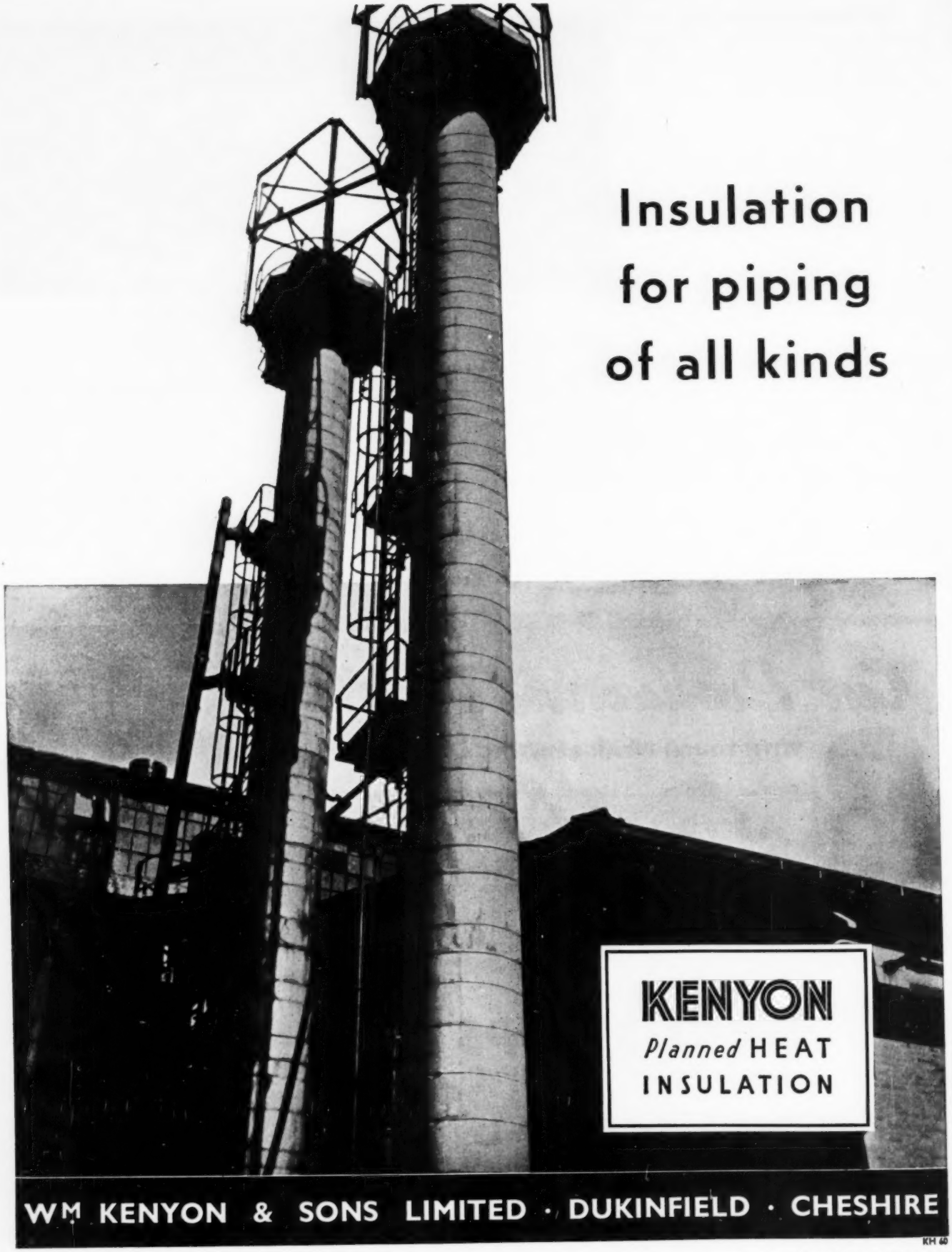
GEORGE ANGUS & Co LTD

ESTABLISHED 1788

OIL SEAL WORKS, NEWCASTLE UPON TYNE, ENGLAND.

EXPORT DIVISION: Angus House, 7, Bury St., St. Mary Axe, London, E.C.3

AGENTS THROUGHOUT THE WORLD


Insulation
for piping
of all kinds
KENYON
Planned HEAT
INSULATION
WM KENYON & SONS LIMITED · DUKINFIELD · CHESHIRE
KH 40

Book Review

Handbook of Chemistry, by Norbert A. Lange, assisted by Gordon M. Forker; 7th revised edition, published 1949 by Handbook Publishers Inc., Sandusky, Ohio; 1920 pages; $7.00.

In speaking of this book some mention should be made of its background. The first edition appeared in 1934, and in 15 years it has passed through seven editions to keep it up with the rapid advances in chemical and physical data, growing in bulk until it is now twice as great in size and content as the first edition. This sustained growth is testimony of its appeal to chemists and engineers, and the width of its distribution is indicated by the fact that the price is only $7.00 which may be considered low for a book of this caliber.

The work is divided into 182 sections, which comprise text and tables in which the user can find nearly any information he may need regarding the chemical elements, inorganic compounds, minerals, organic compounds, an outline of analytical chemistry, qualitative tests, calibration of vessels, typical reactions, solubilities, refractive indices, microscopy, spectroscopy, the data of physical chemistry and industrial chemistry, mathematical tables and geometrical formulas, which all chemists and physicists need to use at one time or another. The index covers 25 pages and contains more than 3,000 entries. This reviewer, who has had frequent occasion to consult it, can recommend it as the largest and best book of the kind he has seen.

Crude for Japan

Invitation to supply 4,005,000 barrels of crude petroleum to Japan was announced on Oct. 8, 1949, by the Japanese Ministry of International Trade and Industry. Delivery required is 480,000 barrels to be landed in Japan before Dec. 15, 1949; 480,000 barrels before Jan. 15, 1950; and 3,045,000 barrels before July 1, 1950. Offering prices are to be CIF Japanese port of unloading and FOB vessel foreign loading port. Offers must be received in Tokyo by October 20. Payment will be in pound sterling only.

Public Opinion Survey

A study of public attitudes toward the oil industry, made by Opinion Research Corporation of Princeton, N. J., shows—as did a similar survey in 1946—that the more people know about the oil industry the better they like it. Three out of four people say the industry tries to serve the best interests of the public, and more than two out of three say their general impression of the industry is favorable.

More than three out of four people think the industry does as well as or better than other industries in improving its products. Almost two out of three say that oil companies try to conserve oil resources. The public, by five to one, ranks service stations as the place where customers get most courtesy and attention. Of every 100 people interviewed, 55 pick service stations, as compared with 11 who name drug stores and 10 who select grocery stores, as the places where they get the most courtesy and attention.

Hedges Heads B of M Minerals Division

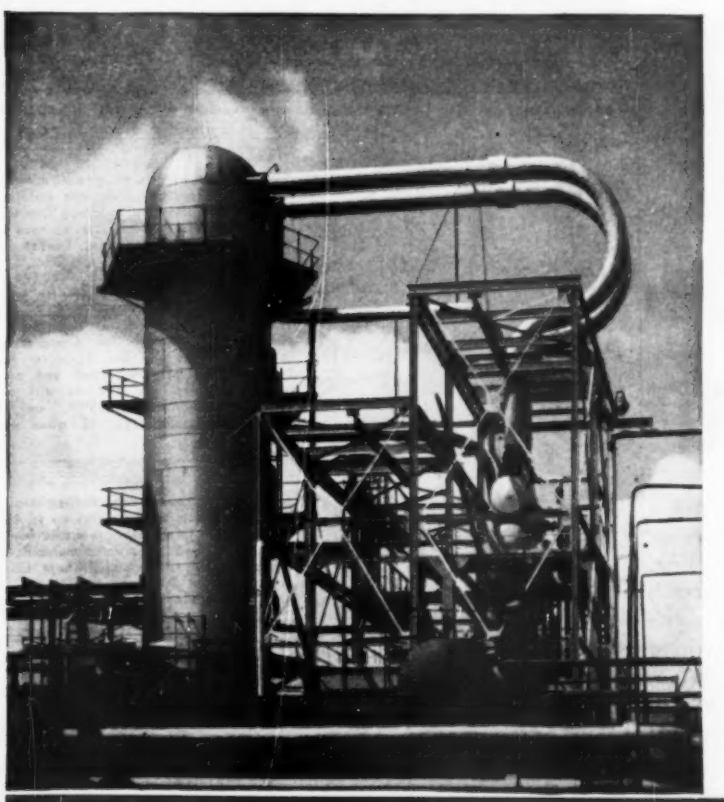
Joseph H. Hedges, recently appointed chief of the new Minerals Division in the United States Bureau of Mines, is a mining engineer and a former assistant to the director of the Bureau. He was superintendent of the southwest experiment station at Tucson, Arizona, until his present appointment became effective Sept. 1. Known as a commodity division, the minerals division combines activities of the old mining, metallurgical and economic and statistics divisions and is part of the Washington staff office. Mr. Hedges will report directly to Director Boyd.

Key Contractor's House.

Tropical Home Ready for Export

A prefabricated home for oil field personnel in foreign fields has been developed by Key Contractors Inc. Built of insulated aluminum panels in the modern manner, the houses are easily erected, light-weight, sturdy, and quickly dismantled and moved to a new location with minimum cost and without skilled labor. Houses may be purchased in functional two and three-bedroom plans. Flexibility in room arrangement and space is possible if houses are purchased in sufficient number.

Erection time is approximately 400 manhours. Wiring is contained in each panel so that when a house is erected, it is also electrically wired. A unitized plumbing grid is fabricated in this country from copper piping. When this grid is anchored in position, the house is completely plumbed. Only the water supply and sewage drain need be connected on the job. The three-bedroom house, which covers 1,035 square feet, may be shipped in one 16,000-pound crate measuring about 8 by 10 by 22 feet.



★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

90-100% LINCOLN

EVERY OILFIELD in the Western World uses Lincoln arc-welding equipment. Every major pipeline is welded with Lincoln. Every manufacturer of pressure vessels to Lloyd's Class I installations uses Lincoln. In the Middle East 90% of arc-welding equipment is Lincoln.

There's no getting away from it. You must have Lincoln 'Shield-Arc' equipment for supreme efficiency in welding. The Lincoln 'Shield-Arc' Welders have *all* the features.

LINCOLN

WORLD'S LARGEST MANUFACTURERS
OF ARC WELDING EQUIPMENT AND ELECTRODES

C. F. Ludwig

Lane-Wells Canadian Company

Lane-Wells Co. has formed the Lane-Wells Canadian Co. with headquarters in Edmonton. A sales office will be located in Calgary. The new company will offer complete facilities for perforating—bullet and Kone-shot—radio-activity well logging, packers and drillable bridging plugs. Officers are Rodney S. Durkee, president; N. L. Dorn, Morton T. Higgs, Jas. D. Hughes, C. F. Ludwig, vice presidents; D. S. Jeppson, secretary-treasurer; W. A. Miller and L. H. Ingle, assistant secretaries and assistant treasurers. C. F. Ludwig, formerly Gulf Coast division sales manager, is vice president in charge of operations. All other officials are active in Lane-Wells Company. Jack Henley will be sales engineer-geologist for Lane-Wells Canadian Co.

The decision to establish complete facilities for the company's technical services in Canada was made following several months investigation to determine the applicability of radio-activity well logging in the Alberta area. J. Murray Walker, Lane-Wells export sales engineer, conducted this study, assisted by a field crew comprised of Burt Garver and J. B. Thompson.

New Tractor Drive

The new International TD-24 diesel crawler tractor has included a planet gear system in the final drive, a new development in the crawler tractor field.

They are used in airplane engines as propeller reductions gears, in winches, hoists and draglines where dead loads subject them to terrific torsional strains. They are used in twin-speed rear axles for heavy-duty trucks, and in certain heavy-duty transmission assemblies, but are new to tractors.

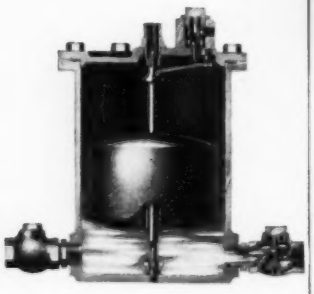
Planet power final drive in the TD-24 serves two distinct functions—it permits gradual turns with power on both tracks or pivot turns with one track locked, and provides a high-low speed range (both forward and in reverse) without shifting of transmission gears. This high-low speed range, in conjunction with the four-speed transmission and the reverse lever, gives the TD-24 eight forward and eight reverse speeds. In operation, the planet power final drive system acts like two dual-speed rear axles, each coupled independently to its respective track, and each hydraulically controlled by a separate lever. Thus, with one control level in the high-speed range position and the other in the low-speed range position, the tractor makes a gradual turn with power on both tracks. With both control levers in the high-speed position, the tractor travels straight forward in high speed range. The same principle applies with both levers in the low-speed position. A third position of either lever locks the corresponding planet drive and track and puts the tractor into a pivot turn.

R. Walton Ball has been appointed managing director of Regent Oil Co. Ltd., London. He previously served the company as sales director. The new appointment was effective Sept. 1, 1949.

Crop Spraying by Plane

Spraying of crops by the use of planes to combat insect pests is extensively practiced in some sections of the United States and is beginning to attract attention in Europe. Spraying from aircraft, both fixed-wing and helicopter, has been in use for sometime in Holland, and recently a group of British agriculturists visited that country as guests of the Royal Dutch-Shell Group to witness a demonstration at Soesterberg for which Prince Bernhard loaned his private plane.

This patent



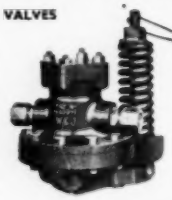
AUTOMATIC PUMP

combines the good qualities of a pressure pump and a vacuum trap. Pumps condensate from low-pressure or vacuum vessels and lifts up to fifty feet; pumps boiling, cold or gaseous fluids (including oils); pumps petrol, benzine, dye liquors and alkaline liquors such as caustic, ammonia, etc.; drains sump holes, pits, excavations (where it may be fully submerged). ENTIRELY AUTOMATIC. *Details of "Ogden's Patent Pump" (in five sizes) from:* OGDEN & CUNLIFFE, (Petroleum Dept.) Charlton House, Cheltenham, Glos., Eng.

WILLIAMS & JAMES
(ENGINEERS) LIMITED
GLOUCESTER ENGLAND

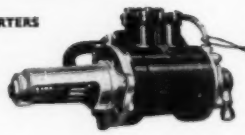
LONDON OFFICE: 4 NEW COURT, LINCOLN'S INN, LONDON W.C.2 TEL. HOLBORN 4635

VALVES



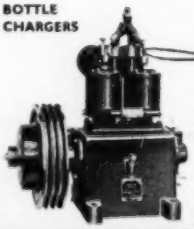
Designed by experts to give a minimum sympathetic pressure drop with variations of upstream pressure. Maximum flow with minimum working drop and absence of pressure creep with no flow. Leaflet No. 43 gives full details.

STARTERS



Air Starting Motors for Compression Ignition Engines and Gas Turbines. Robust, reliable, easy to install and economical in operation. For use with engines from 20-BHP to 750-BHP. Fire risk eliminated. Leaflet No. 32 gives full details.

BOTTLE CHARGERS



Single-stage, heavy duty Bottle-charging Air Compressors for pressures up to 450-lbs p.s.i. Displacement range 2.4—8.7 c.f.m. Machined from finest materials to interchangeable limits. Multi-stage Compressors up to 30 c.f.m. Leaflet No. 41 gives full details.

Technical advice on pneumatic problems gladly given on request.

SPECIALISTS IN COMPRESSED AIR EQUIPMENT & HIGH PRESSURE RAM PUMPS

A Token of PROGRESS

PROGRESS has three meanings, according to Webster. Growth. Movement forward. Improvement.

We have just observed Oil Progress Week, dedicated to the year's accomplishments of the Petroleum Industry. Cities Service contributes to the celebration an expression of confidence in the industry's future, and a record born of that confidence.

For example, Cities Service completed during the year 1949 three major projects

—a $20,000,000 expansion of its East Chicago refinery.

—a $30,000,000 26-inch gas pipe line from the Hugoton field in Kansas to Kansas City.

—a $42,000,000 lube plant, the most modern in the world, at Lake Charles, Louisiana.

This expenditure of nearly $100,000,000 is progress by growth and movement. It is also progress by improvement . . . of processes and products.

For example, the lube plant puts into practice the knowledge of a life-time study of combustion. Cities Service, between 1929 and 1949, analyzed the combustion of ten million vehicles. In the nine days preceding Pearl Harbor it analyzed 24,409 motors for the Office of Civilian Defense.

Cities Service has a first-hand knowledge of what is expected of a motor oil today.

To live up to the "improvement" definition of progress, Cities Service engineers and researchers, working together, are making available daily from this new plant 6000 barrels of lubricating oils designed to meet the many varied needs of this modern age of wheels.

The national welfare requires quality products today as never before. The temperatures, pressures and speeds of America's industrial engines and war machines are increasing almost by the hour. This calls for better grade oils, the finest oils that can be produced. The demand for super-lubricants is imperative, and for thousands of tons per year. The new Lake Charles plant stands ready to meet this demand in both quantity and quality.

We feel it is fitting to chronicle these activities, because, after all, the progress of an industry is but the sum total of its component parts.

Progress through Service has been the motto hanging on our wall from the beginning. It is something more than a motto. Customers who bought $600,000,000 of our goods last year testify that service, as practiced by this Company, is in assisting users to get more out of petroleum products than they would otherwise obtain.

CITIES SERVICE

Progress through Service

WELDING IN OILFIELDS

WITH MUREX EQUIPMENT AND ELECTRODES

Some of the hundreds of Murex arc welding equipments operating on oil pipe line work in the Middle East are shown above. Tropical climates demand the highest efficiency and these equipments incorporate features based on the practical experience of the arduous conditions in oilfields all over the world. They are built to give the best possible welding service with the minimum of maintenance requirements. Over 60 different types of Murex electrodes are available, including types specially developed for the welding of oil pipe lines in the field, hard facing applications, and for all classes of steel and non-ferrous metals.

The Murex welding sets shown in the above illustrations are special 300/400 amp. diesel engine driven single operator equipments. These sets have special filtering arrangements, large fuel tanks, portable regulators, tropical type radiators, folding steel doors and generators with Class B insulation. They are mounted on high speed trailers having a low center of gravity.

MUREX

ELECTRIC ARC WELDING EQUIPMENT & ELECTRODES

MUREX WELDING PROCESSES, LTD. • WALTHAM CROSS, HERTFORDSHIRE, ENGLAND

Telephone Waltham Cross 3636

ADVERTISERS' INDEX

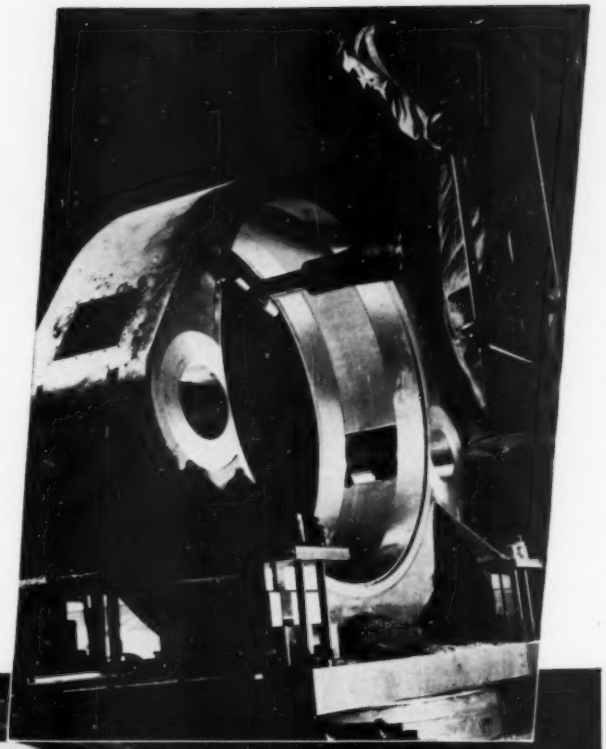
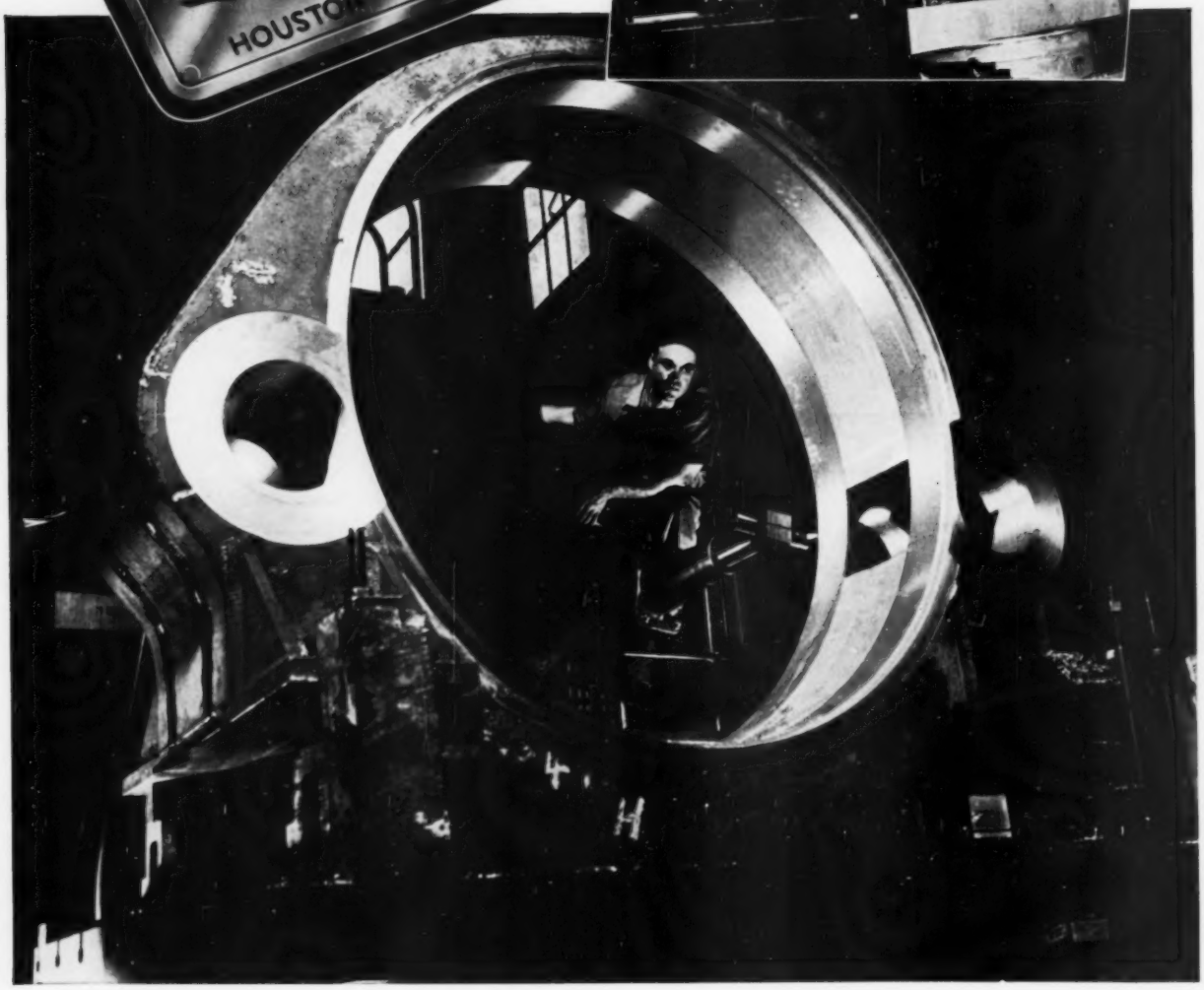
American Cyanamid Co.	71
George Angus & Co. Ltd.	103
Attapulgus Clay Co.	11
E. B. Badger Ltd.	14
Baroid Sales Div.	73
Born Engineering Co.	35
S. R. Bowen Co.	4
British Ceca Co. Ltd	76
British Ropes, Ltd.	90
Brown & Root, Inc.	69
California Texas Oil Co.	16
Chicago Bridge & Iron Co.	1
Cities Service Co.	107
Coody Bender Co.	13
Cooper-Bessemer Corp.	83
Crane Packing Co.	9
Crossley Premier Engines	93
Curran Carbonizing & Engineering Co.	100
Dallas Tank Co.	81
Davison Chemical Corp.	32
Dikkers & Co.	8
Dresser Industries, Inc.	91
Ethyl Corp.	5
Joseph Evans & Co. Ltd.	92
Fluor Corp.	3
Foster Wheeler Corp.	21
Samuel Fox & Co. Ltd.	28
General American Transportation Corp., Wiggins Vapor Seal Div.	29
Graver Construction Co.	88
Gulf Oil Co.	79
Hadfields, Ltd.	85
Halliburton Oil Well Cementing Co.	42
G. A. Harvey & Co. Ltd.	27
Hughes Tool Co.	Inside Back Cover
Independent Exploration Co.	6
International General Electric Co.	17
International Harvester Export Co.	77
International Paints, Ltd.	89
M. O. Johnston Oil Field Export Corp.	33
Jones & Laughlin Supply Co. Engineering & Construction Div.	25
M. W. Kellogg Co.	102
Wm. Kenyon & Sons, Ltd.	104
Lincoln Electric Co. Ltd.	105
The Lummus Co.	39
Manchester Oil Refinery (Sales) Ltd.	31
Mather & Platt Ltd.	24
Arthur G. McKee & Co.	26
Metal Containers Ltd.	74
Murex Welding Co.	108
Negretti & Zambra Ltd.	96
A. P. Newall & Co.	36
Oxley Engineering Co. Ltd.	94
Pacific Valves, Inc.	23
Petroleum Engineering Associates, Inc.	99
Pyrene & Co. Ltd.	38
Sigmund Pumps, Ltd.	31
A. O. Smith Corp.	37
Socony-Vacuum Oil Co., Inc.	87
Spirax Manufacturing Co., Ogden & Cunliffe	106
Standard Oil Co. (Indiana)	93
Standard Oil Co. (New Jersey)	30
Standard-Vacuum Oil Co.	7
Sun Shipbuilding & Dry Dock Co.	95
Tide Water Associated Oil Co.	97
Tidelands Exploration Co.	99
United States Steel Export Co.	15
United Steel Cos.	12
Universal Petroleum Co.	10
Henry Vogt Machine Co.	2
Warren Petroleum Corp.	Inside Front Cover
Watson-Stillman Co.	101
G. & J. Weir Ltd.	98
Williams & James Ltd.	106
Wyatt Metal & Boiler Works	Back Cover
Youngstown Sheet & Tube Co.	34

"FOR FREE CUTTING ACTION WITH LIGHT WEIGHT IT'S HUGHES **OSC** FOR ME"

"I've made a lot of hole in my twenty years of drilling and I've used just about every type bit . . . but I've never run into any bit that's as effective as Hughes OSC in soft strata and where bedding planes of these formations are inclined to the horizontal. It's a lightweight champ and another example of a Hughes 'Engineered Solution.' "

HUGHES TOOL COMPANY
HOUSTON, TEXAS

Standard of the Industry

LARGE WELDMENTS

Fabricated and completely machined by WYATT'S to your specifications. The example pictured is a pump housing with shrunk brass bearings.